(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 395 793 B9

# (12) CORRECTED EUROPEAN PATENT SPECIFICATION

(15) Correction information:
**Corrected version no 1 (W1 B1)**
**Corrections, see**
**Description Paragraph(s) 33, 34, 44, 52, 55, 81, 132**

(48) Corrigendum issued on:
**29.09.2021 Bulletin 2021/39**

(45) Date of publication and mention
of the grant of the patent:
**17.03.2021 Bulletin 2021/11**

(21) Application number: **17167814.7**

(22) Date of filing: **24.04.2017**

(51) Int Cl.:
*C07C 49/84* (2006.01) *C07D 295/108* (2006.01)

## (54) PROCESS FOR THE PREPARATION OF ALPHA-FUNCTIONALIZED KETONES

VERFAHREN ZUR HERSTELLUNG VON ALPHA-FUNKTIONALISIERTEN KETONEN

PROCÉDÉ DE PRÉPARATION DE CÉTONES FONCTIONNALISÉES EN ALPHA

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(43) Date of publication of application:
**31.10.2018 Bulletin 2018/44**

(73) Proprietor: **IGM Group B.V.**
**5145 RM Waalwijk (NL)**

(72) Inventors:
- **SOMMERLADE, Reinhard**
  **79395 Neuenburg am Rhein (DE)**
- **LOERZER, Thomas**
  **76829 Landau-Godramstein (DE)**

(74) Representative: **Maiwald Patent- und Rechtsanwaltsgesellschaft mbH**
**Elisenhof**
**Elisenstraße 3**
**80335 München (DE)**

(56) References cited:
**EP-A1- 0 216 884** **EP-A1- 0 510 754**
**EP-A2- 1 146 033** **WO-A1-02/36437**
**WO-A1-2006/034966** **WO-A2-99/48963**
**FR-A- 1 422 701** **FR-A1- 2 391 183**
**US-A- 4 318 791** **US-A- 4 496 447**
**US-A- 4 691 058** **US-A- 4 740 624**
**US-B1- 6 376 568**

- **CHENGQUN CHEN ET AL: "An Efficient Method for the Synthesis of [alpha]-Hydroxyalkyl Aryl Ketones", SYNTHESIS, vol. 2008, no. 20, 25 September 2008 (2008-09-25), pages 3205-3208, XP055411187, STUTTGART, DE. ISSN: 0039-7881, DOI: 10.1055/s-0028-1083149**
- **AMOLAK C. JAIN ET AL: "Synthesis of Isopentenyiated 4-Hydroxy-3-Methoxycoumarins and [omega]-Methyl-[omega]-Desacetyl Ripariochromene-B", SYNTHETIC COMMUNICATIONS, vol. 6, no. 2, 1 January 1976 (1976-01-01) , pages 147-166, XP055433183, PHILADELPHIA, PA; US ISSN: 0039-7911, DOI: 10.1080/00397917608072625**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Printed by Jouve, 75001 PARIS (FR)

(Cont. next page)

- **Karanj Ketone ET AL: "SYNTHESIS OF BENZO-FURAN DERIVATIVES-I", Tetrahedron, 1 January 1958 (1958-01-01), pages 203-210, XP055433184, Retrieved from the Internet: URL:http://www.sciencedirect.com/science/article/pii/0040402058880412/pdf?md5=b5edb9f1a95a148b6422fba8eebc8af4&pid=1-s2.0-0040402058880412-main.pdf**

## Description

### Field of the invention

**[0001]** The present invention refers to a process for the preparation of an α-functionalized ketone, an α-functionalized ketone obtained by said process.

### Background of the invention

**[0002]** Photopolymerization processes have attained major importance in a large number of applications, for example in overprint coatings, printing inks, in the manufacture of electronic printed circuit boards and printing plates, and in the coating of various substrates, such as wood, plastics, paper, glass or metal, due their tremendous advantages over conventional hardening systems. One advantage of photo-curing by UV irradiation in the presence of photoinitiators is the great speed. However, the speed is heavily dependent on the photoinitiator used. Among the most effective photoinitiators are α-hydroxylated ketones as described e.g. in German Patent No. 2,722,264 and US patent application US 4,740,624. Further methods for the α-functionalization of ketones are described e.g. in Gary Jing Chuang et al., "A Dinuclear Palladium Catalyst for α-Hydroxylation of Carbonyls with O2", J. Am. Chem. Soc. 133, 1760-1762 (2011). Chengqun Chen et al. "An Efficient Method for the Synthesis of α-Hydroxyalkyl Aryl Ketones", Synthesis 2008, No. 20, 3205-3208; Marek Koprowski et al., "Asymmetric oxidation of enol phosphates to α-hydroxy ketones by (salen)manganese(III) complex; Effects of the substitution pattern of enol phosphates on the stereochemistry of oxygen transfer", Tetrahedron 62 12363-12374 (2006); Franklin A. Davis et al., "Oxidation of Silyl Enol Ethers Using 2-Sulfonyloxaziridines; Synthesis of α-Siloxy Epoxides and α-Hydroxy Carbonyl Compounds", J. Org. Chem. 52, 954-955 (1987); Yu-Feng Liang et al., "Highly Efficient C-H Hydroxylation of Carbonyl Compounds with Oxygen under Mild Conditions", Angew. Chem. 2014, 126, 558-562; Yu-Feng Liang et al., "I2- or NBS-Catalyzed Highly Efficient αHydroxylation of Ketones with Dimethyl Sulfoxide", Org. Lett. 17, 876-879 (2015); Bang-Chi Chen et al., "α-hydroxylation of enolates and silyl enol ethers", Organic Reactions, Vol. 62, 2003, published by John Wiley & Sons, Inc.

**[0003]** US 4 740 624 A discloses a process for the preparation of α-hydroxylated ketones carried out by contacting the corresponding alkyl aryl ketone under phase-transfer conditions with a tetrahalogenomethane and an alkali metal hydroxide. WO 2006/034066 A1 discloses a multi-step process for synthesizing an α-amino ketone compound, which comprises reacting an aromatic thioether ketone with chlorine gas, reacting the obtained chlorinated compound either with a primary or secondary amine in the presence of a Lewis acid, or with an alkali alcoholate and subsequently with a primary or secondary amine. The above mentioned reference of Chengqun Chen et al. describes the exposure of alkyl aryl ketones to a mixture of potassium peroxymonosulfate and trifluoroacetic anhydride in the presence of a catalytic amount of iodobenzene to obtain α-hydroxyalkyl aryl ketones.

**[0004]** However, the processes used for the preparation of the α-hydroxylated ketones have a number of disadvantages. In particular, it is to be noted that the α-hydroxylated ketones are prepared by multiple step reactions resulting in a great variety of by-products which reduce the yield and purity of the desired α-hydroxylated ketone. Furthermore, elaborate purification steps are required. Accordingly, the well-known processes of the prior art are quite complex, require costly chemicals or catalysts as well as are time- and chemical-consuming.

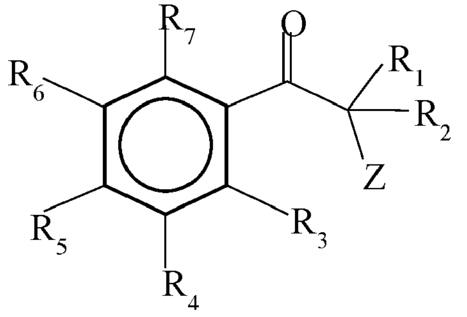
**[0005]** Despite of numerous efforts, a simple and cheap process for this kind of functionalization is still missing. Therefore, there is a continuous need in the art for providing a process for the preparation of α-functionalized ketones avoiding the forgoing disadvantages. In particular, it is desirable to provide a process for the preparation of α-functionalized ketones which avoids a multiple step reaction. Furthermore, it is desirable to provide a process for the preparation of α-functionalized ketones using cheap and safe starting materials. Furthermore, it is desirable to provide a process for the preparation of α-functionalized ketones which avoids elaborate purification steps for obtaining the desired α-functionalized ketones. In addition thereto, it is desirable to provide a process for the preparation of α-functionalized ketones which avoids the formation of excessive by-products and thus increases the yield and purity of the desired α-functionalized ketones. Furthermore, there is still a need for a process which allows the preparation of α-functionalized ketones that have not been accessible by the processes of the prior art up to now.

**[0006]** Accordingly, it is an object of the present invention to provide a process for the preparation of α-functionalized ketones. Furthermore, it is an object of the present invention to provide a one-pot process for the preparation of α-functionalized ketones. It is an even further object of the present invention to provide a process for the preparation of α-functionalized ketones using cheap starting materials and without elaborate purification steps for obtaining the desired α-functionalized ketones. It is an even further object of the present invention to provide a process for the preparation of α-functionalized ketones which increases the yield and purity of the desired α-functionalized ketones. It is another object of the present invention to provide a process which allows the preparation of α-functionalized ketones that have not been accessible by the processes of the prior art up to now. It is a further object of the present specification to provide new α-functionalized ketones that can be used as photoinitiators.

## Summary of the invention

**[0007]** The foregoing and other objects are solved by the subject-matter of the present invention. The present invention provides a process for the preparation of an α-functionalized ketone according to claim 1.

**[0008]** According to the present invention, a process for the preparation of an α-functionalized ketone of the general formula I is provided,

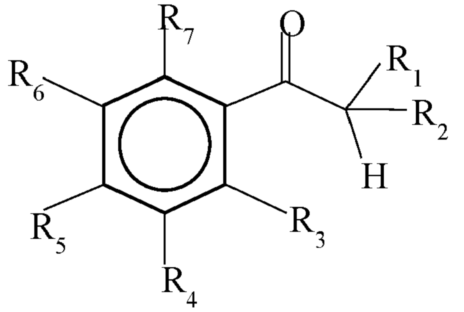

I

wherein $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cyloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom;

$R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_6$-$C_{14}$-aryl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, or two adjacent R form an aromatic system together with the benzene ring of formula I;

Z is selected from $OR_9$, $NHR_9$ and $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O;

characterized in that a ketone of the general formula II


II

wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are as defined above, is contacted under phase-transfer conditions with an at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and i) a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or ii) a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above.

**[0009]** The inventors surprisingly found out that such a process is suitable for the preparation of α-functionalized ketones in a one-pot process by using cheap starting materials and avoiding elaborate purification steps for obtaining the desired α-functionalized ketones. The process for the preparation of α-functionalized ketones thus increases the yield and purity of the desired α-functionalized ketones. Furthermore, the process allows the preparation of α-functionalized ketones that have not been accessible by the processes of the prior art up to now and thus also results in new $\alpha$-functionalized ketones that can be used as photoinitiators.

**[0010]** Advantageous embodiments of the inventive process are defined in the corresponding sub-claims.

**[0011]** According to one embodiment, $R_1$ and $R_2$ are the same.

**[0012]** According to another embodiment, $R_1$ and $R_2$ are selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

**[0013]** According to yet another embodiment, $R_1$ and $R_2$ are different and are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

**[0014]** According to one embodiment, $R_1$ and $R_2$ form $C_4$-$C_{10}$-cycloalkyl, preferably $C_4$-$C_8$-cycloalkyl, and most preferably $C_6$-cycloalkyl, together with the connecting C atom.

**[0015]** According to another embodiment, that $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same.

**[0016]** According to yet another embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

**[0017]** According to one embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and at least one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy; $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

**[0018]** According to another embodiment, one of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl. According to yet another embodiment, two or three of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

**[0019]** According to one embodiment, that $R_3$ and $R_4$ or $R_4$ and $R_5$ form an aromatic system together with the benzene ring of formula I, preferably a bicyclic, tricyclic or tetracyclic aromatic system, more preferably an aromatic system selected from a naphthyl, anthracenyl and phenanthrenyl system.

**[0020]** According to another embodiment, one of the remaining R is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

**[0021]** According to yet another embodiment, Z is $OR_9$ with $R_9$ being selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $R_9$ is H or Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, or $R_{10}$ and $R_{11}$ form a $C_3$-$C_6$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, preferably $R_{10}$ and $R_{11}$ form a $C_5$-$C_6$-alicyclic system together with the connecting N atom and one or more carbon atoms are replaced with O.

**[0022]** According to one embodiment, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is fully halogenated, preferably the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is selected from hexachloroethane, tetrachoroethylene and mixtures thereof.

**[0023]** According to another embodiment, the base is selected from the group comprising sodium hydroxide; lithium hydroxide; potassium hydroxide; sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide; lithium $C_1$-$C_6$-alkoxide, preferably lithium $C_1$-$C_4$-alkoxide and most preferably lithium $C_1$-$C_2$-alkoxide; potassium $C_1$-$C_6$-alkoxide, preferably potassium $C_1$-$C_4$-alkoxide and most preferably potassium $C_1$-$C_2$-alkoxide; and mixtures thereof; or the base is selected from sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide; potassium $C_1$-$C_6$-alkoxide, preferably potassium $C_1$-$C_4$-alkoxide and most preferably potassium $C_1$-$C_2$-alkoxide, together with the protonated form of Z as defined above.

**[0024]** According to yet another embodiment, the base is in form of an aqueous solution or the base is provided in an organic solvent, preferably the organic solvent is selected from the group comprising methanol, ethanol, n-propanol, tert.-butanol, dichloromethane, tetrachloroethylene, tetrahydrofuran, ethyl acetate, acetone, N,N-dimethylformamide, dimethyl sulfoxide, dioxane, such as 1,3-dioxane or 1,4-dioxane, 1,2-dimethoxyethane, diethyleneglycol dimethyl ether, triethyleneglycol dimethyl ether and mixtures thereof.

**[0025]** According to one embodiment, the process is carried out at a temperature of at least 30 °C, preferably in the range from 30 to 120 °C, more preferably in the range from 40 to 100 °C, and most preferably in the range from 40 to 90 °C.

**[0026]** According to another embodiment, the process is carried out in an organic solvent, preferably the organic solvent is selected from the group comprising methanol, ethanol, n-propanol, tert.-butanol, dichloromethane, tetrachloroethylene, tetrahydrofuran, ethyl acetate, acetone, N,N-dimethylformamide, dimethyl sulfoxide, dioxane, such as 1,3-dioxane or 1,4-dioxane, 1,2-dimethoxyethane, diethyleneglycol dimethyl ether, triethyleneglycol dimethyl ether and mixtures thereof.

**[0027]** According to yet another embodiment, the process is carried out in the presence of a phase-transfer catalyst, preferably the phase-transfer catalyst is selected from a quaternary ammonium salt, tetraalkylphosphonium chloride, tetraalkylphosphonium bromide and mixtures thereof, preferably the phase-transfer catalyst is a tetraalkylammonium salt or a trialkylarylammonium salt, more preferably the phase-transfer catalyst is selected from the group comprising benzyltrimethylammonium hydroxide, benzyltriethylammonium chloride, tetrabutylammonium chloride, tetrabutylammonium bromide, tetrabutylammonium hydrogensulfate, tetrabutylammonium hydroxide, methyltrioctylammonium chloride, cetyl pyridinium and mixtures thereof.

**[0028]** According to one embodiment, the $\alpha$-functionalized ketone is obtained in an one-pot reaction.

**[0029]** According to another embodiment, the process further comprises a step of

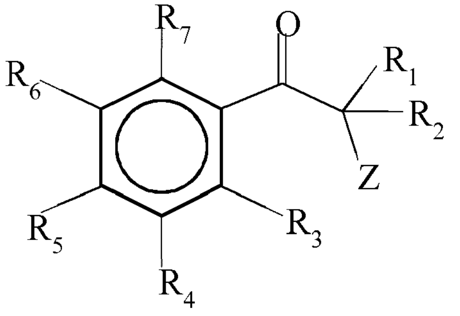
i) separating the obtained organic and aqueous phases, and/or
ii) extracting the obtained aqueous phase with the organic solvent used in the process and combining the obtained organic phases, and/or
iii) acidifying the obtained organic phase to a pH of 3 to 6.5.

**[0030]** According to a further aspect of the present specification, an $\alpha$-functionalized ketone obtained by a process, as defined herein, is provided.

**[0031]** In the following, the details and preferred embodiments of the inventive process for the preparation of an $\alpha$-functionalized ketone will be described in more detail.

## Detailed description of the invention

**[0032]** A process for the preparation of an $\alpha$-functionalized ketone is provided. It is appreciated that an $\alpha$-functionalized ketone of the general formula I is prepared,



I

wherein $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cycloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom;

$R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_6$-$C_{14}$-aryl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, or two adjacent R form an aromatic system together with the benzene ring of formula I;

**[0033]** Z is selected from $OR_9$, $NHR_9$ and $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O.

**[0034]** As regards $R_1$ and $R_2$ in the general formula I, it is to be noted that they can be the same or different. Preferably, $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cycloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom.

**[0035]** The term "linear or branched $C_1$-$C_8$-alkyl" in the meaning of the present invention refers to a linear or branched chain alkyl group having 1 to 8 carbon atoms, and includes, for example, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, secondary butyl, tertiary butyl, pentyl, isopentyl, neopentyl, hexyl, heptyl, octyl, 2-ethylhexyl and 1,1,3,3-tetramethylbutyl.

**[0036]** The term "$C_3$-$C_8$-cycloalkyl" in the meaning of the present invention refers to a cyclic alkyl having 3 to 8 carbon atoms, and includes, for example, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, and cycloheptyl.

**[0037]** The term "$C_5$-$C_8$-cycloalkenyl" in the meaning of the present invention refers to a cyclic alkenyl having 3 to 8 carbon atoms, and includes, for example, cyclopentenyl, cyclohexenyl, and cycloheptenyl.

**[0038]** The term "linear or branched $C_2$-$C_8$-alkenyl" in the meaning of the present invention refers to a linear or branched chain alkenyl group having 2 to 8 carbon atoms, and includes, for example, ethenyl, propenyl such as 2-propenyl, butenyl, pentenyl, hexenyl, heptenyl and octenyl. The term "alkenyl" in the meaning of the present invention includes the cis and trans isomers.

**[0039]** The term "linear or branched $C_2$-$C_8$-alkynyl" in the meaning of the present invention refers to a linear or branched chain alkynyl group having 2 to 8 carbon atoms, and includes, for example, ethynyl, propynyl such as 1-propynyl or 2-propynyl, e.g. propargyl, butynyl, pentynyl, hexynyl, heptynyl and octynyl.

**[0040]** The term "$C_6$-$C_{14}$-aryl" in the meaning of the present invention refers to a group containing one or more 6-membered unsaturated hydrocarbon ring(s), wherein the unsaturation is represented formally by conjugated double bonds and which may optionally be substituted at one or more carbon atoms of such ring(s) by independently selected alkyl groups. Thus, the term "$C_6$-$C_{14}$-aryl" preferably includes (unsubstituted) $C_6$-$C_{10}$-aryl and $C_6$-$C_{14}$-alkylaryl. Suitable examples include, for example, phenyl, naphthyl, methylphenyl, dimethoxyphenyl, 5-isopropyl-2-methylphenyl, methylphenyl, ethylphenyl, dimethylphenyl, t-butylphenyl, methylnaphthyl and dimethylnaphthyl.

**[0041]** The term "form $C_3$-$C_{12}$-cycloalkyl together with the connecting C atom" in the meaning of the present invention refers to a mono-, bi- or tricyclic alkyl having 3 to 12 carbon atoms, and includes, for example, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, norbornyl and adamantyl.

**[0042]** The term "form $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom" in the meaning of the present invention refers to a mono-, bi- or tricyclic alkenyl having 5 to 12 carbon atoms, and includes, one or more, preferably one, double bond(s). Suitable examples include, for example, cyclopentenyl, cyclohexenyl, cyclohexadienyl and cycloheptenyl. It is appreciated that the double bond of the $C_5$-$C_{12}$-cycloalkenyl is located such that an $\alpha,\beta$-unsaturated carbonyl compound is not formed. Thus, $R_1$ and $R_2$ in the general formula I can form $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom with the proviso that no $\alpha,\beta$-unsaturated carbonyl compound is formed.

**[0043]** In one embodiment, $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, or form $C_3$-$C_{12}$-cycloalkyl together with the connecting C atom. Preferably, $R_1$ and $R_2$ are the same or different and are independently selected from H or linear or branched $C_1$-$C_8$-alkyl.

**[0044]** For example, $R_1$ and $R_2$ are the same. In this embodiment, $R_1$ and $R_2$ are preferably selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cycloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom.

**[0045]** In one embodiment, $R_1$ and $R_2$ are the same and are H.

**[0046]** In another embodiment, $R_1$ and $R_2$ are the same and are linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl. For example, $R_1$ and $R_2$ are the same and are linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl. It is especially preferred that $R_1$ and $R_2$ are the same and are $C_1$- or $C_2$-alkyl, e.g. $C_1$-alkyl.

**[0047]** In another embodiment, $R_1$ and $R_2$ form $C_3$-$C_{12}$-cycloalkyl together with the connecting C atom. For example, $R_1$ and $R_2$ form $C_4$-$C_{10}$-cycloalkyl, preferably $C_4$-$C_8$-cycloalkyl, even more preferably $C_4$-$C_6$-cycloalkyl, and most preferably $C_5$- or $C_6$-cycloalkyl, e.g. $C_6$-cycloalkyl, together with the connecting C atom.

**[0048]** In another embodiment, $R_1$ and $R_2$ are the same and are linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl. For example, $R_1$ and $R_2$ are the same and are linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, preferably linear or branched $C_2$-$C_4$-alkenyl, e.g. linear $C_2$-$C_4$-alkenyl, and most preferably linear or branched $C_2$- or $C_3$-alkenyl, e.g. linear $C_2$- or $C_3$-alkenyl. It is especially preferred that $R_1$ and $R_2$ are the same and are $C_3$-alkenyl.

**[0049]** In another embodiment, $R_1$ and $R_2$ are the same and are linear or branched $C_2$-$C_8$-alkynyl, e.g. linear $C_2$-$C_8$-alkynyl. For example, $R_1$ and $R_2$ are the same and are linear or branched $C_2$-$C_6$-alkynyl, e.g. linear $C_2$-$C_6$-alkynyl, preferably linear or branched $C_2$-$C_4$-alkynyl, e.g. linear $C_2$-$C_4$-alkynyl, and most preferably linear or branched $C_2$- or $C_3$-alkynyl, e.g. linear $C_2$- or $C_3$-alkynyl. It is especially preferred that $R_1$ and $R_2$ are the same and are $C_3$-alkynyl.

**[0050]** In another embodiment, $R_1$ and $R_2$ are the same and are linear or branched $C_6$-$C_{14}$-aryl, e.g. (unsubstituted) $C_6$-$C_{10}$-aryl or $C_6$-$C_{14}$-alkylaryl. For example, $R_1$ and $R_2$ are the same and are (unsubstituted) $C_6$- or $C_{10}$-aryl. Alternatively, $R_1$ and $R_2$ are the same and are $C_8$-$C_{12}$-alkylaryl.

**[0051]** In another embodiment, $R_1$ and $R_2$ form $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom. For example, $R_1$ and $R_2$ form $C_5$-$C_{10}$-cycloalkenyl, preferably $C_5$-$C_8$-cycloalkenyl and most preferably $C_5$- or $C_6$-cycloalkenyl, e.g. $C_6$-cycloalkenyl, together with the connecting C atom.

**[0052]** If $R_1$ and $R_2$ are the same, it is preferred that $R_1$ and $R_2$ are linear or branched $C_1$-$C_8$-alkyl, preferably linear $C_1$-$C_8$-alkyl, or form $C_3$-$C_{12}$-cycloalkyl, preferably $C_5$- or $C_6$-cycloalkyl, together with the connecting C atom. More preferably, $R_1$ and $R_2$ are linear or branched $C_1$-$C_8$-alkyl, preferably linear $C_1$-$C_8$-alkyl, or form $C_3$-$C_{12}$-cycloalkyl. Most preferably, $R_1$ and $R_2$ are linear or branched $C_1$-$C_8$-alkyl, preferably linear $C_1$-$C_8$-alkyl. Alternatively, $R_1$ and $R_2$ are different. In this embodiment, $R_1$ and $R_2$ are preferably independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl or $C_6$-$C_{14}$-aryl. For example, $R_1$ and $R_2$ are different and are selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, more preferably linear or branched $C_2$-$C_4$-alkenyl, e.g. linear $C_2$-$C_4$-alkenyl, even more preferably linear or branched $C_2$- or $C_3$-alkenyl, e.g. linear $C_2$- or $C_3$-alkenyl and most preferably $C_3$-alkenyl, and linear or branched $C_2$-$C_8$-alkynyl, e.g. linear $C_2$-$C_8$-alkynyl, preferably linear or branched $C_2$-$C_6$-alkynyl, e.g. linear $C_2$-$C_6$-alkynyl, more preferably linear or branched $C_2$-$C_4$-alkynyl, e.g. linear $C_2$-$C_4$-alkynyl, even more preferably linear or branched $C_2$- or $C_3$-alkynyl, e.g. linear $C_2$- or $C_3$-alkynyl and most preferably $C_3$-alkynyl, e.g. propargyl. In one embodiment, $R_1$ and $R_2$ are different and are selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl. In one embodiment, $R_1$ and $R_2$ are different and are selected from H and $C_1$- or $C_2$-alkyl, preferably $C_2$-alkyl.

**[0053]** If $R_1$ and $R_2$ are different, $R_1$ or $R_2$ is preferably H and the remaining $R_1$ or $R_2$ is preferably linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, even more preferably linear $C_1$-$C_3$-alkyl, and most preferably $C_1$- or $C_2$-alkyl, e.g. $C_2$-alkyl.

**[0054]** Preferably, $R_1$ and $R_2$ are the same.

**[0055]** The $\alpha$-functionalized ketone of the general formula I further comprises residues $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$. It is appreciated that $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ can be the same or different. Furthermore, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_6$-$C_{14}$-aryl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, or two adjacent R form an aromatic system together with the benzene ring of formula I.

**[0056]** The term "$C_1$-$C_8$-alkoxy" in the meaning of the present invention means that the alkoxy moiety has a linear or branched chain alkyl having 1 to 8 carbon atoms, and includes, for example, methoxy, ethoxy, propoxy, isopropoxy, butoxy, isobutoxy, tertiary butoxy, pentyloxy, hexyloxy, heptyloxy and octyloxy.

**[0057]** The term "$C_2$-$C_8$-alkenyloxy" in the meaning of the present invention means that the alkenyloxy moiety has a linear or branched chain alkenyl having 2 to 8 carbon atoms, and includes, for example, ethenyloxy, propenyloxy, butenyloxy, pentenyloxy, hexenyloxy, heptenyloxy and octenyloxy.

**[0058]** The term "$C_3$-$C_8$-cycloalkoxy" in the meaning of the present invention means that the cycloalkoxy moiety has a cyclic alkyl having 3 to 8 carbon atoms, and includes, for example, cyclopropyloxy, cyclobutyloxy, cyclopentyloxy, cyclohexyloxy, and cycloheptyloxy.

**[0059]** The term "$C_7$-$C_{15}$-arylalkoxy" in the meaning of the present invention means that the alkoxy moiety has a linear or branched chain alkyl having 1 to 8 carbon atoms, preferably 1 or 2 carbon atoms, which is connected to $C_6$-$C_{14}$-aryl.

**[0060]** The term "$C_7$-$C_{15}$-arylalkyl" in the meaning of the present invention means that the alkyl moiety is a linear or branched chain alkyl having 1 to 4 carbon atoms, preferably 1 or 2 carbon atoms, which is connected to $C_6$-$C_{14}$-aryl.

**[0061]** The term "$C_9$-$C_{15}$-alkenylarylalkoxy" in the meaning of the present invention means that the alkoxy moiety has a linear or branched chain alkyl having 1 to 8 carbon atoms, preferably 1 or 2 carbon atoms, which is connected to $C_6$-$C_{14}$-aryl, preferably $C_6$-aryl, which is further connected to linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$- alkenyl. Preferably, the alkoxy and alkenyl moieties are connected in para-position of the aryl moiety.

**[0062]** In one embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same. In this embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl. For example, $R_3$, $R_4$, $R_5$, $R_6$

and $R_7$ are the same and are linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. linear $C_1$- or $C_2$-alkyl. It is especially preferred that $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H.

**[0063]** Alternatively, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different. In this embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and at least one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

**[0064]** The term "at least one" in the meaning of the present invention means that one or more of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

**[0065]** For example, one or two or three of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is/are selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom. For example, one or two of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is/are selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or SRs with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom. Preferably, one of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

**[0066]** If $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and at least one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, it is preferred that the remaining ones are selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl. For example, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and at least one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom and the remaining ones are H.

**[0067]** In one embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

**[0068]** For example, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl; preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl; and most preferably $C_2$-$C_3$-alkenyl, e.g. $C_2$-or $C_3$-alkenyl; and the remaining ones are H.

**[0069]** Alternatively, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, e.g. $C_3$- or $C_4$-alkenyloxy, especially $C_3$- alkenyloxy; and the remaining ones are H.

**[0070]** In one embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, e.g. $C_3$- or $C_4$-alkenyloxy, especially $C_3$- alkenyloxy; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl.

**[0071]** For example, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, e.g. $C_3$- or $C_4$-alkenyloxy, especially $C_3$- alkenyloxy; and two of the remaining ones are H and two of the remaining ones are linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl.

**[0072]** Alternatively, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; and the remaining ones are H.

**[0073]** Alternatively, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$- alkyl; and the remaining ones are H.

**[0074]** Alternatively, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $N(R_8)_2$ with $R_8$ forming a $C_3$-$C_9$-alicyclic system, preferably a $C_3$-$C_7$-alicyclic system, more preferably a $C_4$-$C_6$-alicyclic system and most preferably a $C_5$- or $C_6$-alicyclic system, together with the connecting N atom; and the remaining ones are H. Optionally one or more carbon atoms are replaced with O. Preferably, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $N(R_8)_2$ with $R_8$ forming a $C_3$-$C_9$-alicyclic system, preferably a $C_3$-$C_7$-alicyclic system, more preferably a $C_4$-$C_6$-alicyclic system and most preferably a $C_5$- or $C_6$-alicyclic system, together with the connecting N atom, wherein one or more, preferably one, carbon atoms are replaced with O; and the remaining ones are H.

**[0075]** If $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, it is preferred that $R_5$ is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

**[0076]** Thus, if $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, it is preferred that this group is in para-position to the keto group.

**[0077]** In an alternative embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and two or three of them are linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl.

**[0078]** For example, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and two of them are linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkyloxy and most preferably $C_1$-$C_3$-alkyloxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl. Preferably, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and two of them are $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl, preferably the remaining ones are H.

**[0079]** Alternatively, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and two of them are $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl, preferably the remaining ones are H.

**[0080]** In one embodiment, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and three of them are $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl, preferably the remaining ones are H.

**[0081]** If two or three of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkyloxy and most preferably $C_1$-$C_3$-alkyloxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, it is appreciated that preferably $R_4$ and/or $R_5$ and/or $R_6$ are linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkyloxy and most preferably $C_1$-$C_3$-alkyloxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy.

**[0082]** In one embodiment, $R_3$ and $R_4$ or $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic, tricyclic or tetracyclic aromatic system, more preferably an aromatic system selected from a naphthyl, anthracenyl and phenanthrenyl system. The aromatic system is preferably a bicyclic aromatic system, most preferably naphthyl.

**[0083]** For example, $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, preferably H.

**[0084]** It is appreciated that one of the remaining R may be linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; and the remaining ones may be independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$-or $C_2$-alkyl, especially $C_1$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl, preferably H.

**[0085]** In one embodiment, $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl, and $R_3$ is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl, preferably H. For example, $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl, and $R_3$ is $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; and the remaining ones are H.

**[0086]** The α-functionalized ketone of the general formula I further comprises Z being selected from $OR_9$, $NHR_9$ and $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O.

**[0087]** In one embodiment, Z is $OR_9$ with $R_9$ being selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $R_9$ is H or Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, or $R_{10}$ and $R_{11}$ form a $C_3$-$C_6$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, preferably $R_{10}$ and $R_{11}$ form a $C_5$-$C_6$-alicyclic system together with the connecting N atom and one or more carbon atoms are replaced with O.

**[0088]** Preferably, Z is $OR_9$ with $R_9$ being H or $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more carbon atoms, preferably one carbon atom, is/are replaced with O.

**[0089]** An especially preferred α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H, and Z is $OR_9$ with $R_9$ being H.

**[0090]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H, and Z is $OR_9$ with $R_9$ being H.

**[0091]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ form $C_3$-$C_{12}$-cycloalkyl, preferably $C_4$-$C_{10}$-cycloalkyl, more preferably $C_4$-$C_8$-cycloalkyl, even more preferably $C_4$-$C_6$-cycloalkyl, and most preferably $C_5$- or $C_6$-cycloalkyl, e.g. $C_6$-cycloalkyl, together with the connecting C atom; $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H, and Z is $OR_9$ with $R_9$ being H.

**[0092]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H, and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system.

**[0093]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H, and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more, preferably one, carbon atoms are replaced with O.

**[0094]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are the same and are H, and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more, preferably one, carbon atoms are replaced with O.

**[0095]** Alternatively, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is linear or branched $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl, e.g. $C_2$-alkenyl; and the remaining ones are H and Z is $OR_9$ with $R_9$ being H.

**[0096]** For example, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is linear or branched $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl, e.g. $C_2$-alkenyl; and the remaining ones are H and Z is $OR_9$ with $R_9$ being H.

**[0097]** Alternatively, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is linear or branched $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl, e.g. $C_2$-alkenyl; and the remaining ones are H and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more, preferably one, carbon atoms are replaced with O.

**[0098]** For example, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is linear or branched $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl, e.g. $C_2$-alkenyl; and the remaining ones are H and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more, preferably one, carbon atoms are replaced with O.

**[0099]** Alternatively, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; and the remaining ones are H and Z is $OR_9$ with $R_9$ being H.

**[0100]** For example, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; and the remaining ones are H and Z is $OR_9$ with $R_9$ being H.

**[0101]** Alternatively, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; and the remaining ones are H and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more, preferably one, carbon atoms are replaced with O.

**[0102]** For example, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; and the remaining ones are H and Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ forming a $C_5$-$C_6$-alicyclic system, preferably a $C_6$-alicyclic system, together with the connecting N atom and one or more, preferably one, carbon atoms are replaced with O.

**[0103]** Alternatively, the $\alpha$-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them is $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, e.g. $C_3$- or $C_4$-alkenyloxy, especially $C_3$-alkenyloxy; and two of the remaining ones are H and two of the remaining ones are linear or branched $C_1$-$C_8$-alkyl, e.g.

linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; and Z is $OR_9$ with Rg being H.

**[0104]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, e.g. $C_3$- or $C_4$-alkenyloxy, especially $C_3$- alkenyloxy; and two of the remaining ones, preferably $R_3$ and $R_7$, are H and two of the remaining ones, preferably $R_4$ and $R_6$, are linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl, especially $C_1$-alkyl; and Z is $OR_9$ with $R_9$ being H.

**[0105]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and three of them, preferably $R_3$ and $R_4$ and $R_5$, are $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones, preferably $R_6$ and $R_7$ are H; and Z is $OR_9$ with $R_9$ being H.

**[0106]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and three of them, preferably $R_3$ and $R_4$ and $R_5$, are $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones, preferably $R_6$ and $R_7$ are H; and Z is $OR_9$ with $R_9$ being H.

**[0107]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are different and are selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and two of them, preferably $R_4$ and $R_5$, are $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy, especially $C_1$-alkoxy; and the remaining ones, preferably $R_3$, $R_6$ and $R_7$, are H and Z is $OR_9$ with $R_9$ being H.

**[0108]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are different and are H and $C_2$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and two of them, preferably $R_4$ and $R_5$, are $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy, especially $C_1$-alkoxy; and the remaining ones, preferably $R_3$, $R_6$ and $R_7$, are H and Z is $OR_9$ with $R_9$ being H.

**[0109]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are different and are selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $N(R_8)_2$ with $R_8$ forming a $C_3$-$C_9$-alicyclic system, preferably a $C_3$-$C_7$-alicyclic system, more preferably a $C_4$-$C_6$-alicyclic system and most preferably a $C_5$- or $C_6$-alicyclic system, together with the connecting N atom, wherein one or more, preferably one, carbon atoms are replaced with O; and the remaining ones, preferably $R_3$, $R_4$, $R_6$ and $R_7$, are H and Z is $OR_9$ with $R_9$ being H.

**[0110]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are different and are H and $C_2$-alkyl; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and one of them, preferably $R_5$, is $N(R_8)_2$ with $R_8$ forming a $C_3$-$C_9$-alicyclic system, preferably a $C_3$-$C_7$-alicyclic system, more preferably a $C_4$-$C_6$-alicyclic system and most preferably a $C_5$- or $C_6$-alicyclic system, together with the connecting N atom, wherein one or more, preferably one, carbon atoms are replaced with O; and the remaining ones, preferably $R_3$, $R_4$, $R_6$ and $R_7$, are H and Z is $OR_9$ with $R_9$ being H.

**[0111]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl, preferably H, and Z is $OR_9$ with $R_9$ being H.

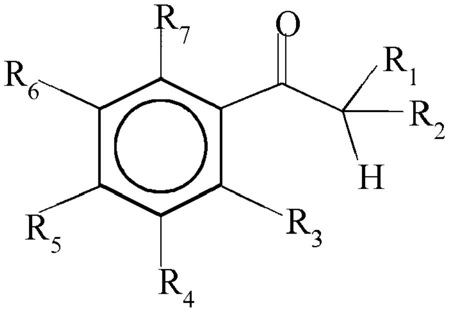
**[0112]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl; and the remaining ones are H and Z is $OR_9$ with $R_9$ being H.

**[0113]** Alternatively, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are selected from linear or branched $C_1$-$C_8$-alkyl, e.g. linear $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, e.g. linear $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl, e.g. linear $C_1$-$C_4$-alkyl, and most preferably linear $C_1$-$C_3$-alkyl, e.g. $C_1$- or $C_2$-alkyl, especially $C_1$-alkyl; $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl; and one of the remaining R, preferably $R_3$, is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy and the remaining ones are H, and Z is $OR_9$ with $R_9$ being H.

**[0114]** For example, the α-functionalized ketone of the general formula I is a ketone, wherein $R_1$ and $R_2$ are the same and are $C_1$-alkyl; $R_4$ and $R_5$ form an aromatic system together with the benzene ring of general formula I, preferably a bicyclic aromatic system, most preferably naphthyl; and one of the remaining R, preferably $R_3$, is $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy and the remaining ones are H, and Z is $OR_9$ with $R_9$ being H.

**[0115]** It is appreciated that the α-functionalized ketone of the general formula I is prepared by a specific process, namely a one-pot process, avoiding elaborate purification steps for obtaining the desired α-functionalized ketones. The yield and purity of the desired α-functionalized ketones are thus significantly increased. Furthermore, the process allows the preparation of α-functionalized ketones that have not been accessible by the processes of the prior art up to now and thus also results in new α-functionalized ketones that can be used as photoinitiators.

**[0116]** The process is characterized in that a ketone of the general formula II



II

wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are as defined above, is contacted under phase-transfer conditions with an at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above.

**[0117]** With regard to the definition of the α-functionalized ketone, the $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the α-functionalized ketone of the general formula I obtained by process of the present invention.

**[0118]** In one embodiment, the ketone of the general formula II is contacted under phase-transfer conditions with the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and the base together with the protonated form of Z.

**[0119]** With regard to the definition of Z and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the α-functionalized ketone of the general formula I obtained by the process of the present invention. Accordingly, it is to be noted that the skilled person will readily understand what is meant by the wording "protonated form of Z".

**[0120]** However, the process is preferably carried out by contacting the ketone of the general formula II under phase-transfer conditions with the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and the base together with the protonated form of Z, if Z in general formula I is $NHR_9$ or $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O.

**[0121]** Accordingly, the protonated form of Z is preferably $HNHR_9$ or $HNR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O.

**[0122]** It is preferred that the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is an at least partially halogenated $C_2$-$C_6$-alkane and/or $C_2$-$C_6$-alkene, more preferably an at least partially halogenated $C_2$-$C_4$-alkane and/or

$C_2$-$C_4$-alkene. For example, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is an at least partially halogenated $C_2$- or $C_3$-alkane and/or $C_2$- or $C_3$-alkene, e.g. an at least partially halogenated $C_2$-alkane and/or $C_2$-alkene.

**[0123]** The at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene may be at least partially chlorinated and/or brominated. For example, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is at least partially chlorinated or brominated. Alternatively, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is at least partially chlorinated and brominated, and thus is a mixed halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene.

**[0124]** Preferably, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is at least partially chlorinated.

**[0125]** In one embodiment, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is fully halogenated. Preferably, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is a fully halogenated $C_2$-$C_6$-alkane and/or $C_2$-$C_6$-alkene, more preferably a fully halogenated $C_2$-$C_4$-alkane and/or $C_2$-$C_4$-alkene. For example, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is a fully halogenated $C_2$- or $C_3$-alkane and/or $C_2$- or $C_3$-alkene.

**[0126]** For example, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene may be fully chlorinated and/or brominated. For example, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is fully chlorinated or brominated. Alternatively, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is fully chlorinated and brominated, and thus is a mixed halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene.

**[0127]** Preferably, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is fully chlorinated.

**[0128]** In one embodiment, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is selected from hexachloroethane, tetrachoroethylene, pentachloropropane, hexabromoethane, tetrabromoethylene, pentabromopropane and mixtures thereof. Preferably, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is hexachloroethane, tetrachoroethylene and mixtures thereof. For example, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is hexachloroethane or tetrachoroethylene.

**[0129]** In one embodiment, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is hexachloroethane and tetrachoroethylene.

**[0130]** Another essential component of the process is the addition of a base. It is a requirement of the present invention that the base is selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above.

**[0131]** In one embodiment, the base is selected from the group comprising sodium hydroxide; lithium hydroxide; potassium hydroxide; sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide; lithium $C_1$-$C_6$-alkoxide, preferably lithium $C_1$-$C_4$-alkoxide and most preferably lithium $C_1$-$C_2$-alkoxide; potassium $C_1$-$C_6$-alkoxide, preferably potassium $C_1$-$C_4$-alkoxide and most preferably potassium $C_1$-$C_2$-alkoxide; and mixtures thereof. Preferably, the base is selected from the group comprising sodium hydroxide and sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide. Most preferably, the base is sodium hydroxide. This embodiment is especially preferred if Z in general formula I is $OR_9$, with $R_9$, being H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl.

**[0132]** Alternatively, the base is selected from sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide; lithium $C_1$-$C_6$-alkoxide, preferably lithium $C_1$-$C_4$-alkoxide and most preferably lithium $C_1$-$C_2$-alkoxide; potassium $C_1$-$C_6$-alkoxide, preferably potassium $C_1$-$C_4$-alkoxide and most preferably potassium $C_1$-$C_2$-alkoxide, and mixtures thereof, together with the protonated form of Z as defined above. Preferably, the base is selected from the group comprising sodium hydroxide and sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide, and mixtures thereof. In one embodiment, the base is sodium hydroxide and/or sodium $C_1$-alkoxide. For example, the base is sodium hydroxide and sodium $C_1$-alkoxide, i.e. a mixture of sodium hydroxide and sodium $C_1$-alkoxide. Alternatively, the base is sodium hydroxide or sodium $C_1$-alkoxide, preferably sodium hydroxide. The combination of a base with the protonated form of Z is especially preferred if Z in general formula I is $NHR_9$ or $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O.

**[0133]** The base can be added as such to the process. Alternatively, the base is in form of an aqueous solution or the base is provided in an organic solvent, preferably the organic solvent is selected from the group comprising methanol, ethanol, n-propanol, tert.-butanol, dichloromethane, tetrachloroethylene, tetrahydrofuran, ethyl acetate, acetone, N,N-dimethylformamide, dimethyl sulfoxide, dioxane, such as 1,3-dioxane or 1,4-dioxane, 1,2-dimethoxyethane, diethyleneglycol dimethyl ether, triethyleneglycol dimethyl ether and mixtures thereof. Preferably, the base is provided in an organic solvent, preferably the organic solvent is tetrachloroethylene.

**[0134]** The process of the present invention can be carried out over a wide temperature range. However, it is preferred that the process is carried out at elevated temperature. For example, the process is carried out at a temperature of at least 30 °C, preferably in the range from 30 to 120 °C, more preferably in the range from 40 to 100 °C, and most preferably in the range from 40 to 90 °C.

**[0135]** It is further appreciated that the process can be carried out in an organic solvent. Preferably the organic solvent is selected from the group comprising methanol, ethanol, n-propanol, tert.-butanol, dichloromethane, tetrachloroethylene, tetrahydrofuran, ethyl acetate, acetone, N,N-dimethylformamide, dimethyl sulfoxide, dioxane, such as 1,3-dioxane or 1,4-dioxane, 1,2-dimethoxyethane, diethyleneglycol dimethyl ether, triethyleneglycol dimethyl ether and mixtures thereof.

**[0136]** If the base is provided in an organic solvent, the organic solvent is preferably the same as used in the process.

**[0137]** It is a further requirement of the present invention that the process is carried out under phase-transfer conditions. Such phase-transfer conditions are well known in the art such that the skilled person will easily apply reaction conditions that are suitable for the reaction mentioned. The skilled person can also apply variants of such reactions which are known per se and are not mentioned herein in detail.

**[0138]** In particular, the contacting of the compound of formula II is carried out in the presence of a phase-transfer catalyst with the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above.

**[0139]** The phase-transfer catalyst can be selected from any phase-transfer catalyst known in the art. However, the phase-transfer catalyst is preferably selected from a quaternary ammonium salt, tetraalkylphosphonium chloride, tetraalkylphosphonium bromide and mixtures thereof. More preferably, the phase-transfer catalyst is a tetraalkylammonium salt or a trialkylarylammonium salt, and most preferably the phase-transfer catalyst is selected from the group comprising benzyltrimethylammonium hydroxide, benzyltriethylammonium chloride, tetrabutylammonium chloride, tetrabutylammonium bromide, tetrabutylammonium hydrogensulfate, tetrabutylammonium hydroxide, methyltrioctylammonium chloride, cetyl pyridinium and mixtures thereof.

**[0140]** Such phase-transfer catalysts are well known in the art such that the skilled person will easily apply catalysts that are suitable for the reaction mentioned. The skilled person can also apply variants of such catalysts which are known per se and are not mentioned herein in detail.

**[0141]** The amount of phase-transfer catalysts can be chosen as desired within wide limits, preferably being 0.1 to 100 wt.-%, based on the weight of the ketone of the general formula II.

**[0142]** One advantage of the present process is that the process can be carried out in a one-pot process, and thus avoids elaborate purification steps for obtaining the desired $\alpha$-functionalized ketones. The yield and purity of the desired $\alpha$-functionalized ketones are thus significantly increased.

**[0143]** The term "one-pot process" in the meaning of the present invention refers to a process that can be carried out without the isolation and purification of intermediate products.

**[0144]** It is thus appreciated that the $\alpha$-functionalized ketone is obtained in a one-pot reaction.

**[0145]** It has been found that the sequence of addition of the reagents is important for the success of the reaction. The best yields are obtained when the ketone of the general formula II, the phase-transfer catalyst, the base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or the base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above and, if present, the organic solvent are contacted first and the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is metered in.

**[0146]** The reaction and contacting are carried out by mixing the components, i.e. the ketone of the general formula II, the phase-transfer catalyst, the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and the base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or the base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above. The skilled person will adapt the mixing conditions (such as the configuration of mixing tools and mixing speed) according to his process equipment.

**[0147]** The process of the present invention may comprise further steps for isolating and/or purifying the obtained $\alpha$-functionalized ketones of general formula I.

**[0148]** For example, the process may further comprise a step of

i) separating the obtained organic and aqueous phases, and/or
ii) extracting the obtained aqueous phase with the organic solvent used in the process and combining the obtained organic phases, and/or
iii) acidifying the obtained organic phase to a pH of 3 to 6.5.

**[0149]** In one embodiment, the process further comprises the steps of

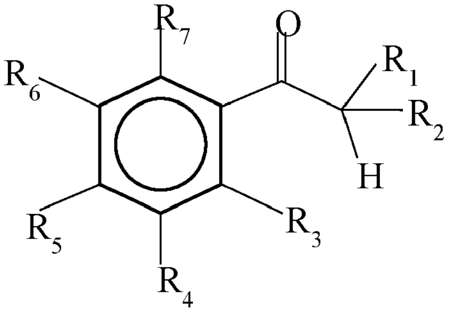
i) separating the obtained organic and aqueous phases, and
ii) extracting the obtained aqueous phase with the organic solvent used in the process and combining the obtained organic phases, and
iii) acidifying the obtained organic phase to a pH of 3 to 6.5.

**[0150]** Additionally, the process may further comprise a step of drying the obtained α-functionalized ketones of general formula I.

**[0151]** The ketone of the general formula II used can be easily α-functionalized in high yields and purity. The residue from work-up, which consists mainly of organic solvent and (unchanged) phase-transfer catalyst, can be reused e.g. in the process as solvent and (re-halogenated) phase-transfer catalyst.

**[0152]** According to another aspect, an α-functionalized ketone obtained by the process as defined herein, is provided.

**[0153]** Thus, the α-functionalized ketone of is obtained by a process comprising the contacting of a ketone of the general formula II



II

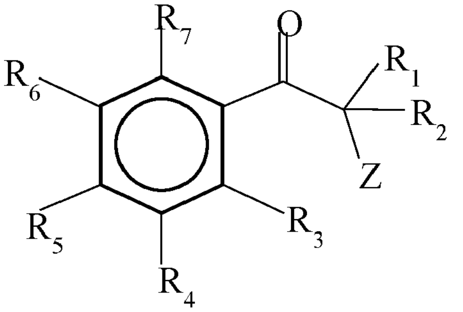
wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are as defined above, under phase-transfer conditions with an at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof, or a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above.

**[0154]** With regard to the definition of the α-functionalized ketone, the ketone of the general formula II, the $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the process and the α-functionalized ketone of the general formula I obtained by the process of the present invention.

**[0155]** The inventors surprisingly found that the process allows the preparation of α-functionalized ketones that have not been accessible by the processes of the prior art up to now and thus also results in new α-functionalized ketones that can be used as photoinitiator.

**[0156]** In another aspect, the present specification thus refers to an α-functionalized ketone as defined herein, with the proviso that at least one of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl, $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy. The α-functionalized ketone is preferably obtained by the process of the present invention.

**[0157]** The new α-functionalized ketone is thus preferably an α-functionalized ketone of the general formula I,



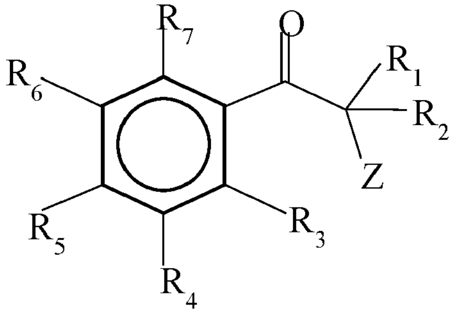
I

wherein $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cycloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_6$-$C_{14}$-aryl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, or two adjacent R form an aromatic system together with the benzene ring of formula I; Z is selected from $OR_9$, $NHR_9$ and $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O; with the proviso that at least one of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, and most preferably $C_2$-$C_3$-alkenyl, $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy.

**[0158]** With regard to the definition of the α-functionalized ketone, $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_7$ and Z and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the process and the α-functionalized ketone of the general formula I obtained by the process of the present invention.

**[0159]** A further aspect thus refers to the use of the new α-functionalized ketone as photoinitiator.

**[0160]** More precisely, the present specification also relates to the use of an α-functionalized ketone of the general formula I as photoinitiator,



I

wherein $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_8$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cycloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom; $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_6$-$C_{14}$-aryl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_6$-$C_{14}$-aryl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, or two adjacent R form an aromatic system together with the benzene ring of formula I; Z is selected from $OR_9$, $NHR_9$ and $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O; with the proviso that at least one of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is linear or branched $C_2$-$C_8$-alkenyl, e.g. linear $C_2$-$C_8$-alkenyl, preferably linear or branched $C_2$-$C_6$-alkenyl, e.g. linear $C_2$-$C_6$-alkenyl, and most preferably $C_2$-$C_3$-alkenyl, $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy, and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy.

**[0161]** With regard to the definition of the α-functionalized ketone, $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, $R_7$ and Z and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the process and the α-functionalized ketone of the general formula I obtained by the process of the present invention.

**[0162]** A further aspect refers to a photopolymerizable composition comprising the α-functionalized ketone as defined herein and at least one photopolymerizable unsaturated compound.

**[0163]** It is appreciated that any photopolymerizable unsaturated compound that is typically used in the articles to be prepared and is well known can be used as the at least one photopolymerizable unsaturated compound. For example, the at least one photopolymerizable unsaturated compound can be a compound as described in WO 2004/099262 A1.

**[0164]** The photopolymerizable composition may also contain optional additives and/or optional further photoinitiators and/or coinitiator. The optional additives and/or photoinitiators and/or coinitiator are not limited any include any additive and/or photoinitiators and/or coinitiator typically used in the articles to be prepared and are well known in the art. For example, the additives and/or photoinitiators and/or coinitiator can be one or more compounds described as additives (C) and/or photoinitiators and/or coinitiator (D) in WO 2004/099262 A1.

**[0165]** A further aspect thus refers to the use of the photopolymerizable composition comprising the $\alpha$-functionalized ketone and at least one photopolymerizable unsaturated compound, as defined herein, as photoinitiator.

**[0166]** It is preferred that the $\alpha$-functionalized ketone of the general formula I or the photopolymerizable composition comprising the $\alpha$-functionalized ketone and at least one photopolymerizable unsaturated compound as defined herein is used as photoinitiator in a method of preparing an article.

**[0167]** Thus, the $\alpha$-functionalized ketone of the general formula I or the photopolymerizable composition comprising the $\alpha$-functionalized ketone and at least one photopolymerizable unsaturated compound as defined herein is preferably used as photoinitiator in an article, preferably a packaging article, more preferably a food or beverage packaging article, an article of flooring or an article of furniture.

**[0168]** With regard to the definition of the $\alpha$-functionalized ketone, the photopolymerizable composition and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the process and the $\alpha$-functionalized ketone of the general formula I obtained by the process of the present invention.

**[0169]** In view of the advantages obtained, the present specification refers in another aspect to a method of preparing an article. The method comprising the steps of

a) preparing a coating and/or ink composition comprising the $\alpha$-functionalized ketone as defined herein or the photopolymerizable composition comprising an $\alpha$-functionalized ketone as defined herein,
b) applying the coating and/or ink composition at least partially on at least one surface of an article, and
c) curing the coating and/or ink composition by means of ultra-violet radiation.

**[0170]** With regard to the definition of the $\alpha$-functionalized ketone, the photopolymerizable composition and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the process and the $\alpha$-functionalized ketone of the general formula I obtained by the process of the present invention.

**[0171]** It is appreciated that coating and/or ink compositions are well known to the skilled person and do not need to be described in more detail in the present application. Thus, any coating and/or ink composition that is typically used for the articles to be prepared and is well known can be used. The person skilled in the art will adapt the coating and/or ink composition according to the article to be prepared and/or his process equipment.

**[0172]** Furthermore, any suitable application means known in the art may be used for carrying out application step b). However, application step b) is preferably carried out by brushing, dripping, printing, spraying, dipping and the like. Most preferably, application step b) takes place by spraying.

**[0173]** Any suitable curing means using ultra-violet radiation known in the art may be used for carrying out curing step c). Such curing steps are well known in the art and the skilled person will adapt the curing conditions according to his process equipment and the article to be prepared.

**[0174]** In view of the above, the present specification refers in another aspect to an article obtained by a method of preparing an article, as defined herein.

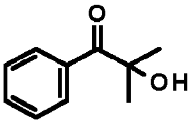
**[0175]** It is preferred that the article is a packaging article, an article of flooring or an article of furniture. If the article is a packaging article, the article is preferably a food or beverage packaging article. If the article is an article of flooring, the article is preferably a tile, most preferably a ceramic, vinyl or composite tile, or a floorboard, most preferably a wooden or composite floorboard.

**[0176]** The scope and interest of the invention will be better understood based on the following examples which are intended to illustrate certain embodiments of the invention and are non-limitative.

## EXAMPLES

### Example 1: Preparation of 2-hydroxy-2-methyl-1-phenyl-1-propanone

**[0177]**



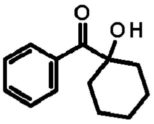
**[0178]** A 500 mL double-walled-jacket, multi-necked flask, fitted with a mechanical stirrer, reflux condenser, connected to a thermostat, thermometer and a dropping funnel, is charged with 59.3 g (400 mmol) isobutyrophenone, 2.58 g (8 mmol) tetrabutylammonium bromide and 373.3 g (2.80 mol) 30% aqueous sodium hydroxide solution. This is heated with stirring to 82-85 °C, and within 90 minutes a solution of 94.7 g (408 mmol) hexachloroethane in 199 g tetrachloroethylene is added. The reaction mixture is stirred for another 3 hours at 84 °C. The temperature is then lowered to 60 °C and left unstirred for phase separation. The lower organic phase is split off; the aqueous phase is extracted with 50 g tetrachloroethylene, the organic phases are combined and 100 g water added. *p*H is then adjusted to 6.0 using 5% acetic acid. The organic phase is split off and distilled in vacuo.

**[0179]** Yield: 56.8 g (86.5%) 2-Hydroxy-2-methyl-1-phenyl-1-propanone as a pale yellow oil; b.p. 96 °C, 1 mbar, 99% purity (GC). NMR data are identical with the data of an authentic reference sample.

**[0180]** Tetrachloroethylene (b.p. 55 °C, 200 mbar) is nearly quantitatively recovered (94%, 99.6% purity).

## Example 2: Preparation of (1-hydroxycyclohexyl) phenyl ketone

**[0181]**



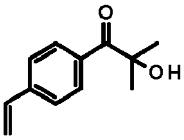
**[0182]** A 500 mL double-walled-jacket multi-necked flask, fitted with a mechanical stirrer, reflux condenser, thermometer and a dropping funnel connected to a thermostat, is charged with 75.3 g (400 mmol) cyclohexyl phenyl ketone, 2.58 g (8 mmol) tetrabutylammonium bromide and 373.3 g (2.80 mol) 30% aqueous sodium hydroxide solution. This is heated with stirring to 82-85 °C and within 90 minutes a solution of 96.6 g (408 mmol) hexachloroethane in 199 g tetrachloroethylene is added. The reaction mixture is stirred for another 3 hours at 84 °C. The temperature is then lowered to 60 °C and left unstirred for phase separation. The lower organic phase is split off; the aqueous phase is extracted with 50 g tetrachloroethylene, the organic phases are combined and 100 g water added. pH is then adjusted to 6.0 using 5% acetic acid. The organic phase is split off and the product is vacuum distilled.

**[0183]** Yield: 66.3 g (81.2%) (1-hydroxycyclohexyl) phenyl ketone (Irgacure 184) as a pale yellow oil;
b.p. 143 °C, 0.7 mbar, 95% purity (GC). NMR data are identical with the data of an authentic reference sample.

**[0184]** Tetrachloroethylene (b.p. 55 °C, 200 mbar) is nearly quantitatively recovered (97%, 99.5% purity).

## Example 3: Preparation of 2-hydroxy-2-methyl-1-(4-vinylphenyl)propan-1-one

**[0185]**

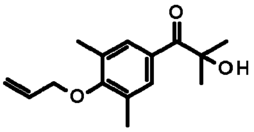


**[0186]** To a multi-necked, double-walled-jacket 500 mL flask, fitted with a thermometer, reflux condenser and a mechanical stirrer was charged 4-vinylisobutyrophenone (1.20 g, 6.89 mmol), tetrabutylammonium bromide (44 mg, 0.14 mmol), sodium hydroxide solution 30% (6.5 g, 48.8 mmol), tetrachloroethylene (6 g) and ProStab (1% solution in toluene, 0.02 g). The mixture was heated to 50 °C with stirring and a solution of hexachloroethane (2.19 g, 9.25 mmol) in tetrachloroethylene (5 g) is added dropwise within 30 minutes time. Stirring is continued overnight at 50 °C, the reaction mixture cooled to ambient temperature and extracted with tetrachloroethylene (3 x 10 mL). The organic phase is acidified to pH 4 with 5% acetic acid, washed with water (3 x 10 mL) and dried with sodium sulfate. The solvent is evaporated to give the product [1.12 g, 5.89 mmol, 86%] as a pale yellow oil.

$^1$*H-NMR* (400.1 MHz, $CDCl_3$): *δ*= 1.61 (s, 6 H), 4.16 (br. s, 1 H), 5.40 (dd, 1 H), 5.87 (dd, 1 H), 6.74 (dd, 1 H), 7.44-7.48 (m, 2 H), 7.98-8.02 ppm (m, 2 H).

### Example 4: Preparation of 1-(4-allyloxy-3,5-dimethyl-phenyl)-2-hydroxy-2-methyl-propan-1-one

**[0187]**

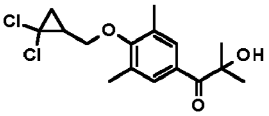


**[0188]** To a reaction flask containing 100 ml of benzene and the solution of NaOH (40 g, 1 mol) in 40 ml of water is added tetrabutylammonium bromide (2 g), 1-(4-allyloxy-3,5-dimethyl-phenyl)-2-methyl-propan-1-one (19.15 g, 0.082 mol, prepared as described below) and hexachloroethane (39 g, 0.165 mol). The heterogeneous mixture is vigorously stirred under nitrogen during 90 minutes at 60°C. The mixture is then cooled to room temperature and diluted with 300 ml of water and 250 ml of *t*-butyl-methyl ether. The organic phase is separated and the aqueous phase is extracted with 200 ml of t-butyl-methyl ether. The combined organic phases are dried over magnesium sulfate and evaporated. The semisolid product (34 g) is chromatographed on silica gel with hexane-ethyl acetate (4:1) to afford 18.69 g of the title product as a light yellow oil.

$^1$H-NMR ($CDCl_3$, 400 MHz, δ ppm): 7.73 (s, 2ArH), 6.15-6.07 (m, 1H), 5.48-5.47 (dd, 1H), 5.44-5.42 (dd, 1H), 4.38-4.36 (d, 2H, $CH_2$), 4.22 (s, 1H, OH), 2.34 (s, 2x$CH_3$), 1.64 (s, 2x$CH_3$)

### Example 5 (Comparative example to example 4): Preparation of 1-(4-allyloxy-3,5-dimethyl-phenyl)-2-hydroxy-2-methyl-propan-1-one using tetrachloromethane

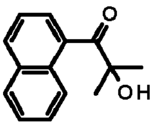
**[0189]** Running the reaction described in example 4 under same conditions, but replacing hexachloroethane with tetrachloromethane, leads to the formation of a considerable amount (-10%) of the side-product 1-[4-[(2,2-dichlorocyclopropyl)-methoxy]-3,5-dimethyl-phenyl]-2-hydroxy-2-methyl-propan-1-one.



**[0190]** Analytical data for 1-[4-[(2,2-dichlorocyclopropyl)-methoxy]-3,5-dimethyl-phenyl]-2-hydroxy-2-methyl-propan-1-one:
Colorless oil
MS for $C_{16}H_{20}Cl_2O_3$ (331.23); found M = 331.
$^1$H-NMR ($CDCl_3$, 400 MHz, δ ppm): 7.72 (s, 2 ArH), 4.20 (s, 1H, OH), 4.06-3.91 (m, 2H, $CH_2$-O), 2.36 (s, 2x$CH_3$), 2.19-2.11 (m, 1H), 1.77-1.72 (m, 1H), 1.61 (s, 2x$CH_3$), 1.35-1.25 (s, 1H).

### Example 6: Preparation of 2-hydroxy-2-methyl-1-(1-naphthyl)propan-1-one

**[0191]**

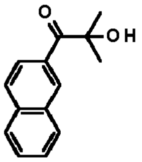


**[0192]** Using the same equipment as in examples 1-5, to a mixture of 1-isobutyronaphthone (1.40 g, 7.06 mmol), tetrabutylammonium bromide (46 mg, 0.14 mmol), sodium hydroxide solution 30% (6.6 g, 49.5 mmol) and tetrachloroethylene (5 g) is added hexachloroethane (1.84 g, 7.77 mmol) dissolved in tetrachloroethylene (4 g). This mixture is stirred at 50 °C for 4.5 h. After cooling to room temperature, acetic acid 5% is added to adjust pH to 4 and the organic phase is washed with water (3 x 10 mL). The organic phase is dried over sodium sulfate and the evaporated to dryness.

The crude product is purified by column chromatography [*c*-$C_6H_{12}$/AcOEt, 4:1 v:v] and the title compound is isolated as a pale yellow oil [0.95 g, 4.43 mmol, 63%] .
*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$= 1.52 (s, 6 H), 3.87 (s, 1 H), 7.43 (dd, 1 H), 7.47-7.53 (m, 2 H), 7.56 (dd, 1 H), 7.73-7.79 (m, 1 H), 7.82-7.87 (m, 1 H), 7.88-7.91 ppm (m, 1 H)

## Example 7: Preparation of 2-hydroxy-2-methyl-1-(2-naphthyl)propan-1-one

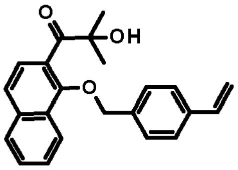
**[0193]**



**[0194]** A 25 mL three-necked flask is charged 2-isobutyronaphthone (0.50 g, 2.52 mmol), tetrabutylammoniumbromide (16 mg, 0.05 mmol), sodium hydroxide solution (30%, 2.35 g, 17.65 mmol) and tetrachloroethylene (10 g). To this is added hexachloroethane (0.66 g, 2.77 mmol), dissolved in tetrachlorethylene (2.5 g) and the reaction mixture is stirred at 50 °C overnight. After cooling to room temperature, pH is adjusted to 4 with 5% acetic acid and the organic phase washed with water (3 x 10 mL). The organic phase is dried over sodium sulfate and the solution evaporated to dryness. The crude product is purified by column chromatography on silicagel [*c*-$C_6H_{12}$/AcOEt, 9:1 v:v], providing the title compound as a yellowish oil.
*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$= 1.71 (s, 6 H), 4.16 (s, 1 H), 7.53-7.63 (m, 2 H), 7.85-7.89 (m, 2 H), 7.95 (dd, 1 H), 8.05 (dd, 1 H), 8.60 (d, 1 H)

## Example 8: Preparation of 2-hydroxy-2-methyl-1-[1-[(4-vinylphenyl)methoxy]-2-naphthyl]propan-1-one

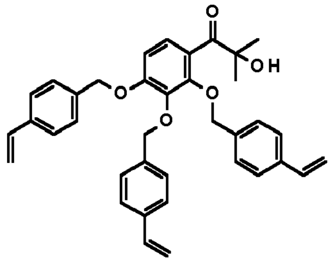
**[0195]**



**[0196]** To a mixture of 2-methyl-1-[1-[(4-vinylphenyl)methoxy]-2-naphthyl]propan-1-one (0.40 g, 1.21 mmol), tetrabutylammonium bromide (8 mg, 0.02 mmol), sodium hydroxide solution (30%, 1.13 g, 8.47 mmol) and tetrachloroethylene (3.5 g) is added a solution of hexachloroethane (0.32 g, 1.33 mmol) in tetrachloroethylene (1 g) at 50 °C. Stirring is continued for 4 h at 50 °C. After cooling to room temperature, the organic phase is split off and the aqueous phase is extracted with tetrachloroethylene (3 x 10 mL). After *p*H of the organic phase is adjusted to 4 (5% acetic acid), the organic phase is washed with water (3 x 10 mL), dried over sodium sulfate and evaporated to dryness. The crude product is subjected to column chromatography [*c*-$C_6H_{12}$/AcOEt, 19:1 v:v] to give the title compound [0.42 g, 1.96 mmol, 78%] as a slightly yellow oil.
*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$= 1.45 (s, 6 H), 3.96 (s, 1 H), 5.04 (s, 2 H), 5.27 (dd, 1 H), 5.77 (dd, 1 H), 6.73 (dd, 1 H), 7.31 (d, 1 H), 7.40-7.47 (m, 4 H), 7.51-7.57 (m, 2 H), 7.67 (d, 1 H), 7.84-7.90 (m, 1 H), 8.11-8.16 ppm (m, 1H); *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$= 27.2, 78.3, 114.4, 122.5, 124.0, 124.7, 126.6, 127.0, 127.5, 127.7, 128.3, 128.9, 130.8, 135.7, 135.9, 136.4, 137.9, 151.7, 212.0 ppm

## Example 9: Preparation of 2-hydroxy-2-methyl-1-[2,3,4-tris[(4-vinylphenyl)methoxy]-phenyl]propan-1-one

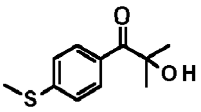
**[0197]**



**[0198]** To a 25 mL three-necked flask is charged 2-methyl-1-[2,3,4-tris[(4-vinylphenyl)methoxy]phenyl]propan-1-one (250 mg, 0.46 mmol), tetrabutylammonium bromide (3 mg, 0.01 mmol), sodium hydroxide solution (30%, 0.43 g, 3.22 mmol) and tetrachloroethylene (2.5 g). To this is added a solution of hexachloroethane (120 mg, 0.50 mmol) in tetrachlorethylene (0.8 g). The reaction mixture is stirred at 50 °C overnight. The reaction mixture is allowed to come to room temperature and extracted with tetrachloroethylene (3 x 10 mL), the organic phase *p*H-adjusted to 4, washed with water (3 x 10 mL), dried over sodium sulfate and evaporated to dryness. The residue is chromatographed on silicagel [heptanes/AcOEt, 4:1 v:v] giving the title compound [220 mg, 0.39 mmol, 86%] as a pale yellow oil.
IGM
B 15265-EP *$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$= 1.35 (s, 6 H), 3.99 (s, 1 H), 5.04-5.10 (3 x s, 3 x 2 H), 5.22-5.30 (3 x dd superimposed, 3 x 1 H), 5.71-5.79 (3 x dd superimposed, 3 x 1 H), 6.65-6.78 (3 x dd superimposed, 3 x 1 H), superimposed with 6.76 (d, 1 H), 6.98 (d, 1 H), 7.20-7.44 ppm (m, 12 H); *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$= 27.3, 70.9, 75.4, 76.7, 78.0, 109.6, 123.3, 126.3, 126.4, 126.5, 127.3, 127.8, 128.9, 129.0, 135.8, 136.0, 136.4, 136.5, 136.6, 137.6, 137.7, 141.4, 150.0, 155.1, 210.4 ppm

## Example 10: Preparation of 2-hydroxy-2-methyl-1-(4-methylthiophenyl)propan-1-one

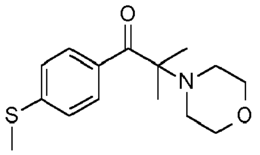
**[0199]**



**[0200]** Sodium hydroxide solution (w=50%, 12.35 g, 154.4 mmol) and tetrabutylammonium bromide (0.15 g, 0.46 mmol) were added to a solution of 2-methyl-1-(4-methylthiophenyl)-propan-1-one (3.00 g, 15.4 mmol) and hexachloroethane (5.48 g, 23.16 mmol) in tetrachloroethylene (8 mL). The reaction mixture was stirred at 50°C for four hours. The resulting solution was taken up with water (20 mL) and the phases were separated. The pH of the aqueous layer was adjusted to 3 with diluted HCl solution. Afterwards, it was extracted with tetrachloroethylene (3 x 50 mL). The combined organic phases were washed with brine (50 mL), dried over sodium sulfate and the solvent was removed under reduced pressure. The crude product was obtained as a yellow oil (2.96 g, 14.1 mmol, 91% yield).
*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$= 1.64 (s, 6H), 2.54 (s, 3H), 4.12 (wide s, 1H), 7.26-7.32 (m, 2H), 7.96-8.02 (m, 2 H) ppm. *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$= 14.7, 28.6, 76.1, 124.79, 129.4, 130.3, 146.3 ppm.

## Reference Example 11: Preparation of 2-methyl-1-(4-methylthiophenyl)-2-morpholino-propan-1-one

**[0201]**

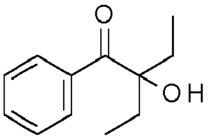


**[0202]** A mixture of sodium methoxide (30% in methanol, 5.56 g, 30.9 mmol), methanol (5), 2-methyl-1-(4-methylthiophenyl)propan-1-one (1.00 g, 5.14 mmol) and hexachloroethane (1.34 g, 5.66 mmol) was stirred at room temperature for 2 d. Then, methanol was removed from the reaction mixture by distillation under reduced pressure and morpholine (22.4 g, 257 mmol) and sodium hydroxide solution (50%, 4.12 g, 51.5 mmol) were added. The reaction mixture was stirred under reflux for 10 h. Then, the reaction mixture was cooled down to room temperature, the solvent evaporated under reduced pressure and the residue taken up with water (30 mL). The phases were separated and pH of the aqueous layer was adjusted to 1.0 with hydrochloric acid solution (1M). The aqueous layer was extracted with tert-butylmethylether (3 x 50 mL) to remove impurities. Then the pH of the aqueous layer was adjusted to 14.0 with sodium hydroxide solution (50%) and extracted again with tert-butylmethylether (3 x 50 mL). The combined organic layers of the second extraction were washed with brine (50 mL), dried over $Na_2SO_4$ and the solvent was removed under vacuum. The crude product of 2-methyl-1-(4-methylthiophenyl)-2-morpholino-propan-1-one was obtained as slightly yellowish crystals, (0.91 g, 3.3 mmol, 63 % yield).

*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$ = 1.31 (s, 6H), 2.53 (s, 3H), 2.55-2.61 (m, 4H), 3.66-3.73 (m, 4H), 7.20-7.26 (m, 2H), 8.49-8.54 (m, 2 H) ppm. *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$ = 14.4, 20.4, 47.2, 67.3, 68.3, 124.3, 130.3, 131.8, 144.9, 201.9 ppm. Melting point: 66-68 °C

## Example 12: Preparation of 2-ethyl-2-hydroxy-1-phenyl-butan-1-one

**[0203]**

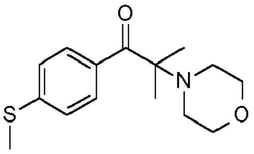


**[0204]** Sodium hydroxide solution (w=50%, 9.08 g, 113 mmol) and tetrabutylammonium hydrogensulfate (0.19 g, 0.57 mmol) were added to a solution of 2-ethyl-1-phenyl-butan-1-one (2.00 g, 11.4 mmol) and hexachloroethane (2.96 g, 12.48 mmol) in tetrachloroethylene (12 mL). The reaction mixture was stirred at 50°C for 1.5 d. The resulting solution was taken up with water (20 mL) and the phases were separated. The pH of the aqueous layer was adjusted to 3 with dilute HCl solution (1M), and extracted with tetrachloroethylene (3 x 50 mL). The combined organic phases were washed with brine (50 mL), dried over sodium sulfate and the solvent was removed under reduced pressure. 2-Ethyl-2-hydroxy-1-phenyl-butan-1-one was obtained as a colorless oil (2.09 g, 10.9 mmol, 96% yield).

*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$ = 0.82-0.86 (t, 6H), 1.92-2.04 (m, 2H), 2.06-2.18 (m, 2H), 4.39 (s, 1H), 7.45-7.54 (m, 2H), 7.58-7.65 (m, 1H), 7.97-8.05 (m, 2H) ppm.

## Example 13: Preparation of 2-methyl-1-(4-methylthiophenyl)-2-morpholino-propan-1-one

**[0205]**

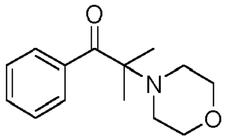


**[0206]** A mixture of sodium methoxide (30% in methanol, 5.56 g, 30.9 mmol), methanol (5), 2-methyl-1-(4-methylthiophenyl)propan-1-one (1.00 g, 5.14 mmol) and hexachloroethane (1.34 g, 5.66 mmol) was stirred at 40°C for 24 h. Then, morpholine (22.4 g, 257 mmol) was added and methanol was removed from the reaction mixture by distillation. Afterwards, sodium hydroxide solution (50%, 4.12 g, 51.5 mmol) and tetrabutylammonium hydrogensulfate (0.09 g, 0.27 mmol) were added and the reaction mixture was stirred under reflux for 10 h. Then, the reaction mixture was cooled down to room temperature, the solvent was evaporated under reduced pressure and the residue was taken up with water (30 mL). The phases were separated and the pH of the aqueous layer was adjusted to 7 with saturated ammonium chloride solution. The aqueous layer was extracted with ethyl acetate (3 x 50 mL). The combined organic layers were washed with brine (50 mL), dried over $Na_2SO_4$ and the solvent was evaporated. The crude product was purified by preparative thin layer chromatography on silica gel [cyclohexane/ethyl acetate, 5:1 v:v]. 2-methyl-1-(4-methylthiophenyl)-2-morpholino-propan-1-one was obtained as a colorless oil (0.95 g, 3.2 mmol, 61 % yield).

*$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$ = 1.31 (s, 6H), 2.53 (s, 3H), 2.55-2.61 (m, 4H), 3.66-3.73 (m, 4H), 7.20-7.26 (m, 2H), 8.49-8.54 (m, 2 H) ppm. *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$ = 14.4, 20.4, 47.2, 67.3, 68.3, 124.3, 130.3, 131.8, 144.9, 201.9 ppm.

### Reference Example 14: Preparation of 2-methyl-2-morpholino-1-phenylpropan-1-one

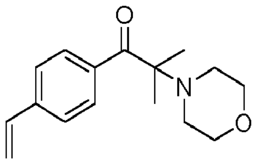
**[0207]**



**[0208]** A mixture of sodium methoxide (30% in methanol, 22.1 g, 0.410 mol), methanol (30 mL), isobutyrophenone (10.12 g, 68.28 mmol) and hexachloroethane (32.33 g, 136.6 mmol) was stirred at 40 °C for 2 d. Then, further sodium methoxide (30% in methanol, 11.85 g, 0.221 mol) and another equivalent of hexaxhloroethane (16.2 g, 68.3 mmol) was added and the reaction mixture was stirred at 50 °C for 6 h. Afterwards, methanol was removed from the reaction mixture by distillation under reduced pressure and morpholine (150 g, 1.72 mol) and sodium hydroxide solution (50%, 54.6 g, 0.683 mol) were added. The reaction mixture was stirred overnight at 110°C. Then, it was cooled down to room temperature and slowly poured into conc. hydrochloric acid solution (500 mL). The aqueous layer was separated, the pH was adjusted to 0 by adding further conc. hydrochloric acid solution and then it was extracted with tert-butylmethylether (3 x 200 mL) to remove impurities. Then, the pH of the aqueous layer was adjusted to 14 with sodium hydroxide solution (50%) and extracted again with tert-butylmethylether (3 x 200 mL). The combined organic layers of the second extraction were washed with brine (2 x 100 mL), dried over $Na_2SO_4$ and the solvent was evaporated. The crude product of 2-methyl-2-morpholino-1-phenylpropan-1-one was obtained as red crystals, (7.60 g, 32.6 mmol, 48 % yield). *$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$ = 1.34 (s, 6H), 2.57-2.63 (m, 4H), 3.68-3.76 (m, 4H), 7.40-7.46 (m, 2H), 7.50-7.54 (m, 1H), 8.53-8.58 (m, 2H) ppm. *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$ = 20.3, 47.1, 67.4, 68.4, 124.9, 130.3, 132.4, 135.9, 203.3 ppm. Melting point: 79-81 °C

### Reference Example 15: Preparation of 2-methyl-2-morpholino-1-(4-vinylphenyl)propan-1-one

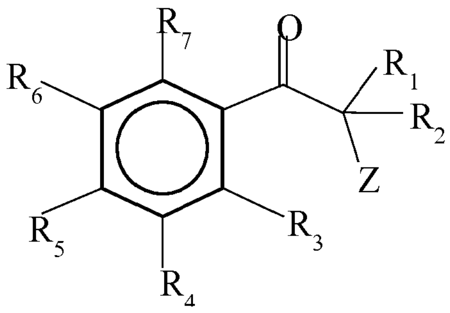
**[0209]**



**[0210]** A mixture of sodium methoxide (30% in methanol, 3.72 g, 68.9 mmol), methanol (5 mL), 2-methyl-1-(4-vinylphenyl)propan-1-one (2.00 g, 11.5 mmol) and hexachloroethane (5.45 g, 23.0 mmol) was stirred at 40 °C for 2 d. Then, further sodium methoxide (30% in methanol, 1.85 g, 34.2 mmol) and another equivalent of hexachloroethane (2.75 g, 11.4 mmol) was added and the reaction mixture was stirred at 50 °C for 6 h. Afterwards, methanol was removed from the reaction mixture by distillation under reduced pressure and morpholine (25.0 g, 0.287 mol) and sodium hydroxide solution (50%, 9.18 g, 0.115 mol) were added. The reaction mixture was stirred overnight at 110°C. Then, it was cooled down to room temperature and slowly poured into conc. hydrochloric acid solution (50 mL). The aqueous layer was separated, the pH was adjusted to 0 by adding further conc. hydrochloric acid solution and then it was extracted with tert-butylmethylether (3 x 20 mL) to remove impurities. Then, the pH of the aqueous layer was adjusted to 14 with sodium hydroxide solution (50%) and extracted again with tert-butylmethylether (3 x 20 mL). The combined organic layers of the second extraction were washed with brine (2 x 10 mL), dried over $Na_2SO_4$ and the solvent was evaporated. The crude product was purified by preparative thin layer chromatography on silica gel (*c*- $C_6H_{12}$ : AcOEt = 2 : 1, v : v). 2-methyl-2-morpholino-1-(4-vinylphenyl)propan-1-one was obtained as a colorless oil, (1.78 g, 6.86 mmol, 60 % yield). *$^1$H-NMR* (400.1 MHz, $CDCl_3$): $\delta$ = 1.35 (s, 6H), 2.59-2.62 (m, 4H), 3.71-3.73 (m, 4H), 5.39 (dd, 1H), 5.89 (dd, 1H), 6.77 (dd, 1H) 7.42-7.50 (m, 2H), 8.51-8.58 (m, 2H) ppm. *$^{13}$C-NMR* (100.6 MHz, $CDCl_3$): $\delta$ = 20.2, 47.1, 67.4, 68.4, 116.3, 125.6, 130.7, 134.9, 136.1, 141.4, 202.6 ppm.

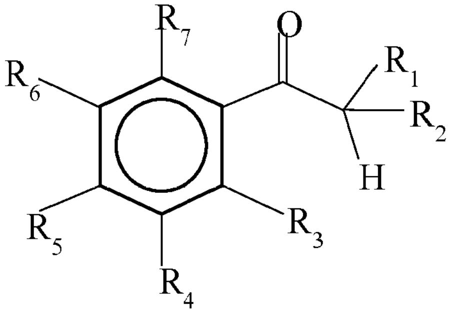
## Claims

**1.** A process for the preparation of an $\alpha$-functionalized ketone of the general formula I,



I

wherein $R_1$ and $R_2$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_3$-cycloalkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_5$-$C_8$-cycloalkenyl, linear or branched $C_2$-$C_8$-alkynyl, $C_6$-$C_{14}$-aryl or form $C_3$-$C_{12}$-cycloalkyl or $C_5$-$C_{12}$-cycloalkenyl together with the connecting C atom;
$R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same or different and are independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_3$-cycloalkyl, $C_6$-$C_{14}$-aryl, $C_3$-$C_3$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_6$-$C_{14}$-aryl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_3$-cycloalkyl, $C_3$-$C_3$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, or two adjacent R form an aromatic system together with the benzene ring of formula I;
Z is selected from $OR_9$, $NHR_9$ and $NR_{10}R_{11}$ with $R_9$, $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_8$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_6$-$C_{14}$-aryl, $C_7$-$C_{15}$-arylalkyl, $C_7$-$C_{15}$-arylalkoxy, $C_9$-$C_{15}$-alkenylarylalkoxy, $C_9$-$C_{15}$-alkenylarylalkyl; or $R_{10}$ and $R_{11}$ form a $C_3$-$C_9$-alicyclic system together with the connecting N or C atom, optionally one or more carbon atoms are replaced with O;
**characterized in that** a ketone of the general formula II



II

wherein $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are as defined above, is contacted under phase-transfer conditions with an at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene, and

i) a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof,
or
ii) a base selected from the group comprising alkali metal hydroxide, earth alkali metal hydroxide, alkali metal $C_1$-$C_8$-alkoxide, earth alkali metal $C_1$-$C_8$-alkoxide and mixtures thereof together with the protonated form of Z as defined above.

**2.** The process according to claim 1, **characterized in that** $R_1$ and $R_2$ are the same.

**3.** The process according to claim 2, **characterized in that** $R_1$ and $R_2$ are selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

**4.** The process according to claim 1, **characterized in that** $R_1$ and $R_2$ are different and are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

5. The process according to claim 1, **characterized in that** $R_1$ and $R_2$ form $C_4$-$C_{10}$-cycloalkyl, preferably $C_4$-$C_8$-cycloalkyl, and most preferably $C_6$-cycloalkyl, together with the connecting C atom.

6. The process according to any one of claims 1 to 5, **characterized in that** $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are the same.

7. The process according to claim 6, **characterized in that** $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

8. The process according to any one of claims 1 to 5, **characterized in that** $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are different and at least one of them is selected from linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_9$-$C_{15}$-alkenylarylalkoxy or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom.

9. The process according to any one of claims 1 to 5 or 8, **characterized in that** one of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; or $N(R_8)_2$ or $SR_8$ with $R_8$ being selected from linear or branched $C_1$-$C_8$-alkyl or linear or branched $C_2$-$C_8$-alkenyl or $R_8$ form a $C_3$-$C_9$-alicyclic system together with the connecting N atom; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

10. The process according to any one of claims 1 to 5 or 8, **characterized in that** two or three of $R_3$, $R_4$, $R_5$, $R_6$ and $R_7$ are linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_1$-$C_8$-alkoxy, preferably $C_1$-$C_6$-alkoxy and most preferably $C_1$-$C_3$-alkoxy; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy, and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

11. The process according to any one of claims 1 to 5, **characterized in that** $R_3$ and $R_4$ or $R_4$ and $R_5$ form an aromatic system together with the benzene ring of formula I, preferably a bicyclic, tricyclic or tetracyclic aromatic system, more preferably an aromatic system selected from a naphthyl, anthracenyl and phenanthrenyl system.

12. The process according to claim 11, **characterized in that** one of the remaining R is linear or branched $C_2$-$C_8$-alkenyl, preferably $C_2$-$C_6$-alkenyl and most preferably $C_2$-$C_3$-alkenyl; $C_2$-$C_8$-alkenyloxy, preferably $C_2$-$C_6$-alkenyloxy and most preferably $C_3$-$C_5$-alkenyloxy; and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $C_9$-$C_{12}$-alkenylarylalkoxy and most preferably $C_9$-$C_{10}$-alkenylarylalkoxy; and the remaining ones are independently selected from H and linear or branched $C_1$-$C_8$-alkyl, preferably linear or branched $C_1$-$C_6$-alkyl, more preferably linear or branched $C_1$-$C_4$-alkyl and most preferably linear $C_1$-$C_3$-alkyl.

13. The process according to any one of claims 1 to 12, **characterized in that** Z is $OR_9$ with $R_9$ being selected from H, linear or branched $C_1$-$C_8$-alkyl, linear or branched $C_2$-$C_8$-alkenyl, $C_1$-$C_8$-alkoxy, $C_2$-$C_8$-alkenyloxy, $C_3$-$C_3$-cycloalkyl, $C_3$-$C_8$-cycloalkoxy, $C_7$-$C_{15}$-arylalkoxy and $C_9$-$C_{15}$-alkenylarylalkoxy, preferably $R_9$ is H or Z is $NR_{10}R_{11}$ with $R_{10}$ and $R_{11}$ being independently selected from H, linear or branched $C_1$-$C_8$-alkyl, $C_3$-$C_3$-cycloalkyl, $C_6$-$C_{14}$-aryl, or $R_{10}$ and $R_{11}$ form a $C_3$-$C_6$-alicyclic system together with the connecting N atom, optionally one or more carbon atoms are replaced with O, preferably $R_{10}$ and $R_{11}$ form a $C_5$-$C_6$-alicyclic system together with the connecting N atom and one or more carbon atoms are replaced with O.

14. The process according to any one of claims 1 to 13, **characterized in that** the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is fully halogenated, preferably the at least partially halogenated $C_2$-$C_8$-alkane and/or $C_2$-$C_8$-alkene is selected from hexachloroethane, tetrachoroethylene and mixtures thereof.

15. The process according to any one of claims 1 to 14, **characterized in that** the base is selected from the group

comprising sodium hydroxide; lithium hydroxide;
potassium hydroxide; sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide; lithium $C_1$-$C_6$-alkoxide, preferably lithium $C_1$-$C_4$-alkoxide and most preferably lithium $C_1$-$C_2$-alkoxide; potassium $C_1$-$C_6$-alkoxide, preferably potassium $C_1$-$C_4$-alkoxide and most preferably potassium $C_1$-$C_2$-alkoxide; and mixtures thereof; or the base is selected from sodium $C_1$-$C_6$-alkoxide, preferably sodium $C_1$-$C_4$-alkoxide and most preferably sodium $C_1$-$C_2$-alkoxide; potassium $C_1$-$C_6$-alkoxide, preferably potassium $C_1$-$C_4$-alkoxide and most preferably potassium $C_1$-$C_2$-alkoxide, together with the protonated form of Z as defined above.

16. The process according to any one of claims 1 to 14, **characterized in that** the base is in form of an aqueous solution or the base is provided in an organic solvent, preferably the organic solvent is selected from the group comprising methanol, ethanol, n-propanol, tert.-butanol, dichloromethane, tetrachloroethylene, tetrahydrofuran, ethyl acetate, acetone, N,N-dimethylformamide, dimethylsulfoxide, dioxane, such as 1,3-dioxane or 1,4-dioxane, 1,2-dimethoxyethane, diethyleneglycol dimethyl ether, triethyleneglycol dimethyl ether and mixtures thereof.

17. The process according to any one of claims 1 to 16, **characterized in that** the process is carried out at a temperature of at least 30 °C, preferably in the range from 30 to 120 °C, more preferably in the range from 40 to 100 °C, and most preferably in the range from 40 to 90 °C.

18. The process according to any one of claims 1 to 17, **characterized in that** the process is carried out in an organic solvent, preferably the organic solvent is selected from the group comprising methanol, ethanol, n-propanol, tert.-butanol, dichloromethane, tetrachloroethylene, tetrahydrofuran, ethyl acetate, acetone, N,N-dimethylformamide, dimethylsulfoxide, dioxane, such as 1,3-dioxane or 1,4-dioxane, 1,2-dimethoxyethane, diethyleneglycol dimethyl ether, triethyleneglycol dimethyl ether and mixtures thereof.

19. The process according to any one of claims 1 to 18, **characterized in that** the process is carried out in the presence of a phase-transfer catalyst, preferably the phase-transfer catalyst is selected from a quaternary ammonium salt, tetraalkylphosphonium chloride, tetraalkylphosphonium bromide and mixtures thereof, preferably the phase-transfer catalyst is a tetraalkylammonium salt or a trialkylarylammonium salt, more preferably the phase-transfer catalyst is selected from the group comprising benzyltrimethylammonium hydroxide, benzyltriethylammonium chloride, tetrabutylammonium chloride, tetrabutylammonium bromide, tetrabutylammonium hydrogensulfate, tetrabutylammonium hydroxide, methyltrioctylammonium chloride, cetyl pyridinium and mixtures thereof.

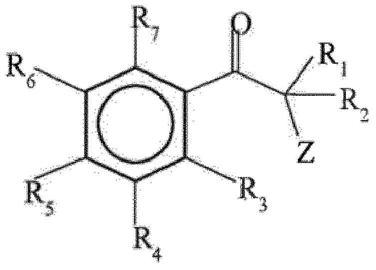
20. The process according to any one of claims 1 to 19, **characterized in that** the $\alpha$-functionalized ketone is obtained in an one-pot reaction.

21. The process according to any one of claims 1 to 20, **characterized in that** the process further comprises a step of

    i) separating the obtained organic and aqueous phases, and/or
    ii) extracting the obtained aqueous phase with the organic solvent used in the process and combining the obtained organic phases, and/or
    (iii) acidifying the obtained organic phase to a pH of 3 to 6.5.

## Patentansprüche

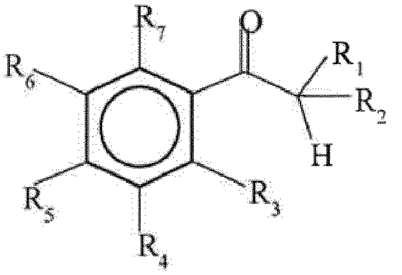
1. Verfahren zur Herstellung eines $\alpha$-funktionalisierten Ketons der Formel



I

wobei $R_1$ und $R_2$ gleich oder verschieden sein können und unabhängig voneinander ausgewählt sind aus H, linearem

oder verzweigtem $C_1$-$C_8$-Alkyl, $C_3$-$C_8$-Cycloalkyl, linearem oder verzweigtem $C_2$-$C_8$-Alkenyl, $C_5$-$C_8$-Cycloalkenyl, linearem oder verzweigtem $C_2$-$C_8$-Alkinyl, $C_6$-$C_{14}$-Aryl oder zusammen mit dem verbrückenden C-Atom $C_3$-$C_{12}$-Cycloalkyl oder $C_5$-$C_{12}$-Cycloalkenyl bilden;
$R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ gleich oder verschieden sein können und unabhängig voneinander ausgewählt sind aus H, linearem oder verzweigtem $C_1$-$C_8$-Alkyl, linearem oder verzweigtem $C_2$-$C_8$-Alkenyl, $C_1$-$C_8$-Alkoxy, $C_2$-$C_8$-Alkenyloxy, $C_3$-$C_8$-Cycloalkyl, $C_6$-$C_{14}$-Aryl, $C_3$-$C_8$-Cycloalkoxy, $C_7$-$C_{15}$-Arylalkoxy, $C_9$-$C_{15}$-Alkenylarylalkoxy, $N(R_8)_2$ oder $SR_8$, wobei $R_8$ ausgewählt ist aus linearem oder verzweigtem $C_1$-$C_8$-Alkyl, linearem oder verzweigtem $C_2$-$C_8$-Alkenyl, $C_6$-$C_{14}$-Aryl, $C_1$-$C_8$-Alkoxy, $C_2$-$C_8$-Alkenyloxy, $C_3$-$C_8$-Cycloalkyl, $C_3$-$C_8$-Cycloalkoxy, $C_7$-$C_{15}$-Arylalkoxy, $C_9$-$C_{15}$-Alkenylarylalkoxy, oder $R_8$ bildet ein $C_3$-$C_9$-alicyclisches System mit dem verbrückenden N-Atom, wobei optional ein oder mehrere Kohlenstoffatome durch O ersetzt werden, oder zwei benachbarte R mit dem Benzolring der Formel I ein aromatisches System bilden;
Z ist ausgewählt aus $OR_9$, $NHR_9$ und $NR_{10}R_{11}$ mit $R_9$, $R_{10}$ und $R_{11}$ unabhängig voneinander ausgewählt aus H, linearem oder verzweigtem $C_1$-$C_8$-Alkyl, linearem oder verzweigtem $C_2$-$C_8$-Alkenyl, $C_1$-$C_8$-Alkoxy, $C_2$-$C_8$-Alkenyloxy, $C_3$-$C_8$-Cycloalkyl, $C_3$-$C_8$-Cycloalkoxy, $C_6$-$C_{14}$-Aryl, $C_7$-$C_{15}$-Arylalkyl, $C_7$-$C_{15}$-Arylalkoxy, $C_9$-$C_{15}$-Alkenylarylalkoxy, $C_9$-$C_{15}$-Alkenylarylalkyl; oder $R_{10}$ und $R_{11}$ bilden ein $C_3$-$C_9$-alicyclisches System mit dem verbrückenden N oder C-Atom, wobei optional ein oder mehrere Kohlenstoffatome durch O ersetzt werden;
**dadurch gekennzeichnet, dass** ein Keton der allgemeinen Formel II



II

wobei $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ wie oben definiert sind, unter Phasen-Transfer-Bedingungen mit einem zumindest teilweise halogenierten $C_2$-$C_8$-Alkan und/oder $C_2$-$C_8$-Alken in Kontakt gebracht wird, und

i) eine Base ausgewählt aus der Gruppe bestehend aus Alkalimetall Hydroxid, Erdalkalimetall Hydroxid, Alkalimetall $C_1$-$C_8$-Alkoxide, Erdalkalimetall $C_1$-$C_8$-Alkoxid und Gemischen aus diesen,
oder
ii) eine Base ausgewählt aus der Gruppe enthaltend Alkalimetall Hydroxid, Erdalkalimetall Hydroxid, Alkalimetall $C_1$-$C_8$-Alkoxid, Erdalkalimetall $C_1$-$C_8$-Alkoxid und Gemischen aus diesen zusammen mit der protonierten Form von Z wie oben definiert.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** $R_1$ und $R_2$ gleich sind.

3. Verfahren nach Anspruch 2, **dadurch gekennzeichnet, dass** $R_1$ und $R_2$ ausgewählt sind aus H und linearem oder verzweigtem $C_1$-$C_8$-Alkyl, bevorzugt linearem oder verzweigtem $C_1$-$C_6$-Alkyl, mehr bevorzugt linearem oder verzweigtem $C_1$-$C_4$-Alkyl und am meisten bevorzugt linearem $C_1$-$C_3$-Alkyl.

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** $R_1$ und $R_2$ verschieden sind und unabhängig voneinander ausgewählt sind aus linearem oder verzweigtem $C_1$-$C_8$-Alkyl, bevorzugt linearem oder verzweigtem $C_1$-$C_6$-Alkyl, mehr bevorzugt lineares oder verzweigtes $C_1$-$C_4$-Alkyl und am meisten bevorzugt linearem $C_1$-$C_3$-Alkyl.

5. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** $R_1$ und $R_2$ $C_4$-$C_{10}$-Cycloalkyl, bevorzugt $C_4$-$C_8$-Cycloalkyl, und am meisten bevorzugt $C_6$-Cycloalkyl mit dem verbrückenden C-Atom bilden.

6. Verfahren nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** $R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ gleich sind.

7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** $R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ ausgewählt sind aus H und linearem oder verzweigtem $C_1$-$C_8$-Alkyl, bevorzugt linearem oder verzweigtem $C_1$-$C_6$-Alkyl, mehr bevorzugt linearem oder verzweigtem $C_1$-$C_4$-Alkyl und am meisten bevorzugt linearem $C_1$-$C_3$-Alkyl.

8. Verfahren nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** $R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ verschieden

sind und mindestens einer von ihnen ausgewählt ist aus linearem oder verzweigtem $C_1$-$C_8$-Alkyl, linearem oder verzweigtem $C_2$-$C_3$-Alkenyl, $C_1$-$C_8$-Alkoxy, $C_2$-$C_8$-Alkenyloxy, $C_9$-$C_{15}$-Alkenylarylalkoxy oder $N(R_8)_2$ oder $SR_8$ mit $R_8$ ausgewählt aus linearem oder verzweigtem $C_1$-$C_8$-Alkyl oder linearem oder verzweigtem $C_2$-$C_8$-Alkenyl oder $R_8$ bildet ein $C_3$-$C_9$-alicyclisches System mit dem verbrückenden N-Atom.

**9.** Verfahren nach einem der Ansprüche 1 bis 5 oder 8, **dadurch gekennzeichnet, dass** einer von $R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ linear oder verzweigtes $C_2$-$C_8$-Alkenyl, bevorzugt $C_2$-$C_6$-Alkenyl und am meisten bevorzugt $C_2$-$C_3$-Alkenyl ist; $C_1$-$C_8$-Alkoxy, bevorzugt $C_1$-$C_6$-Alkoxy, am meisten bevorzugt $C_1$-$C_3$-Alkoxy; $C_2$-$C_8$-Alkenyloxy, bevorzugt $C_2$-$C_6$-Alkenyloxy, am meisten bevorzugt $C_3$-$C_5$-Alkenyloxy; $C_9$-$C_{15}$-Alkenylarylalkoxy, bevorzugt $C_9$-$C_{12}$-Alkenylarylalkoxy, am meisten bevorzugt $C_9$-$C_{10}$-Alkenylarylalkoxy ist; oder $N(R_8)_2$ oder $SR_8$ mit $R_8$ ausgewählt aus linearem oder verzweigtem $C_1$-$C_8$-Alkyl oder linearem oder verzweigtem $C_2$-$C_8$-Alkenyl oder $R_8$ ein $C_3$-$C_9$-alicyclisches System mit dem verbrückenden N-Atom bildet; und die übrigen unabhängig voneinander ausgewählt sind aus H und linearem oder verzweigten $C_1$-$C_8$-Alkyl, bevorzugt linearem oder verzweigtem $C_1$-$C_6$-Alkyl, mehr bevorzugt linearem oder verzweigtem $C_1$-$C_4$-Alkyl und am meisten bevorzugt linearem $C_1$-$C_3$-Alkyl.

**10.** Verfahren nach einem der Ansprüche 1 bis 5 oder 8, **dadurch gekennzeichnet, dass** zwei oder drei von $R_3$, $R_4$, $R_5$, $R_6$ und $R_7$ linear oder verzweigtes $C_2$-$C_8$-Alkenyl, bevorzugt $C_2$-$C_6$-Alkenyl und am meisten bevorzugt $C_2$-$C_3$-Alkenyl sind; $C_1$-$C_8$-Alkoxy, bevorzugt $C_1$-$C_6$-Alkoxy, und am meisten bevorzugt $C_1$-$C_3$-Alkoxy sind; $C_2$-$C_8$-Alkenyloxy, bevorzugt $C_2$-$C_5$-Alkenyloxy, und am meisten bevorzugt $C_3$-$C_5$-Alkenyloxy sind; und $C_9$-$C_{15}$-Alkenylarylalkoxy, bevorzugt $C_9$-$C_{12}$-Alkenylarylalkoxy und am meisten bevorzugt $C_9$-$C_{10}$-Alkenylarylalkoxy sind, und die übrigen unabhängig voneinander ausgewählt sind aus H und linearem oder verzweigtem $C_1$-$C_8$-Alkyl, bevorzugt linearem oder verzweigtem $C_1$-$C_6$-Alkyl, mehr bevorzugt linearem oder verzweigtem $C_1$-$C_4$-Alkyl, und am meisten bevorzugt linearem $C_1$-$C_3$-Alkyl.

**11.** Verfahren nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** $R_3$ und $R_4$ oder $R_4$ und $R_5$ ein aromatisches System bilden mit dem Benzolring der Formel I, bevorzugt ein bicyclisches, tricyclisches oder tetracyclisches aromatisches System, mehr bevorzugt ein aromatisches System ausgewählt aus einem Naphthyl, Anthracenyl und Phenanthrenyl.

**12.** Verfahren nach Anspruch 11, **dadurch gekennzeichnet, dass** einer der übrigen R lineares oder verzweigtes $C_2$-$C_8$-Alkenyl, bevorzugt $C_2$-$C_6$-Alkenyl, und am meisten bevorzugt $C_2$-$C_3$-Alkenyl ist; $C_2$-$C_8$-Alkenyloxy, bevorzugt $C_2$-$C_6$-Alkenyloxy und besonders bevorzugt $C_3$-$C_5$-Alkenyloxy ist; und $C_9$-$C_{15}$-Alkenylarylalkoxy, bevorzugt $C_9$-$C_{12}$-Alkenylarylalkoxy und besonders bevorzugt $C_9$-$C_{10}$-Alkenylarylalkoxy ist; und die übrigen unabhängig voneinander ausgewählt sind aus H und linearem oder verzweigtem $C_1$-$C_8$-Alkyl, bevorzugt linearem oder verzweigtem $C_1$-$C_6$-Alkyl, mehr bevorzugt linearem oder verzweigtem $C_1$-$C_4$-Alkyl und besonders bevorzugt linearem $C_1$-$C_3$-Alkyl.

**13.** Verfahren nach einem der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** Z $OR_9$ ist wobei $R_9$ ausgewählt ist aus H, linearem oder verzweigten $C_1$-$C_8$-Alkyl, linearem oder verzweigten $C_2$-$C_8$-Alkenyl, $C_1$-$C_8$-Alkoxy, $C_2$-$C_8$-Alkenyloxy, $C_3$-$C_8$-Cycloalkyl, $C_3$-$C_8$-Cycloalkoxy, $C_7$-$C_{15}$-Arylalkoxy und $C_9$-$C_{15}$-Alkenylarylalkoxy, wobei $R_9$ bevorzugt H ist oder Z ist $NR_{10}R_{11}$ mit $R_{10}$ und $R_{11}$ unabhängig voneinander ausgewählt aus H, linearem oder verzweigtem $C_1$-$C_8$-Alkyl, $C_3$-$C_8$-Cycloalkyl, $C_6$-$C_{14}$-Aryl, oder $R_{10}$ und $R_{11}$ bilden ein $C_3$-$C_6$-alicyclisches System mit dem verbrückenden N-Atom, wobei optional ein oder mehrere Kohlenstoffatome durch O ersetzt werden, $R_{10}$ und $R_{11}$ vorzugsweise mit dem verbrückenden N-Atom ein $C_5$-$C_6$ alicyclisches System bilden und ein oder mehrere Kohlenstoffatome durch O ersetzt sind.

**14.** Verfahren nach einem der Ansprüche 1 bis 13, **dadurch gekennzeichnet, dass** das zumindest teilweise halogenierte $C_2$-$C_8$-Alkan und/oder $C_2$-$C_8$-Alken vollständig halogeniert ist, bevorzugt ist das zumindest teilweise halogenierte $C_2$-$C_8$-Alkan und/oder $C_2$-$C_8$-Alken ausgewählt aus Hexachlorethan, Tetrachlorethylen und Gemischen aus diesen.

**15.** Verfahren nach einem der Ansprüche 1 bis 14, **dadurch gekennzeichnet, dass** die Base ausgewählt ist aus der Gruppe umfassend Natriumhydroxid; Lithiumhydroxid; Kaliumhydroxid; Natrium $C_1$-$C_6$-Alkoxid, bevorzugt Natrium $C_1$-$C_4$-Alkoxid und am meisten bevorzugt Natrium $C_1$-$C_2$-Alkoxid; Lithium $C_1$-$C_6$-Alkoxid, bevorzugt Lithium $C_1$-$C_4$-Alkoxid und am meisten bevorzugt Lithium $C_1$-$C_2$-Alkoxid, Kalium $C_1$-$C_6$-Alkoxid, bevorzugt Kalium $C_1$-$C_4$-Alkoxid und am meisten bevorzugt Kalium $C_1$-$C_2$-Alkoxid; und Gemische aus diesen; oder die Base ist ausgewählt aus Natrium $C_1$-$C_6$-Alkoxid, bevorzugt Natrium $C_1$-$C_4$-Alkoxid und am meisten bevorzugt Natrium $C_1$-$C_2$-Alkoxid; Kalium $C_1$-$C_6$-Alkoxid, bevorzugt Kalium $C_1$-$C_4$-Alkoxid und am meisten bevorzugt Kalium $C_1$-$C_2$-Alkoxid zusammen mit der protonierten Form von Z wie oben definiert.

16. Verfahren nach einem der Ansprüche 1 bis 14, **dadurch gekennzeichnet, dass** die Base in Form einer wässrigen Lösung oder in einem organischen Lösungsmittel bereitgestellt wird, wobei das organische Lösungsmittel bevorzugt ausgewählt ist aus der Gruppe umfassend Methanol, Ethanol, n-Propanol, tert.-Butanol, Dichlormethan, Tetrachlorethylen, Tetrahydrofuran, Ethylacetat, Aceton, N,N-Dimethylformamid, Dimethylsulfoxid, Dioxan, wie 1,3-Dioxan oder 1,4-Dioxan, 1,2-Dimethoxyethan, Diethylenglycoldimethylether, Triethylenglycoldimethylether und Gemischen aus diesen.

17. Verfahren nach einem der Ansprüche 1 bis 16, **dadurch gekennzeichnet, dass** das Verfahren bei einer Temperatur von mindestens 30 °C, bevorzugt im Bereich von 30 bis 120 °C, mehr bevorzugt im Bereich von 40 bis 100 °C, am meisten bevorzugt im Bereich von 40 bis 90 °C durchgeführt wird.

18. Verfahren nach einem der Ansprüche 1 bis 18, **dadurch gekennzeichnet, dass** das Verfahren in einem organischen Lösungsmittel durchgeführt wird, wobei das organische Lösungsmittel bevorzugt ausgewählt ist aus der Gruppe umfassend Methanol, Ethanol, n-Propanol, tert.-Butanol, Dichlormethan, Tetrachlorethylen, Tetrahydrofuran, Ethylacetat, Aceton, N,N-Dimethylformamid, Dimethylsulfoxid, Dioxan, wie 1,3-Dioxan oder 1,4-Dioxan, 1,2-Dimethoxyethan, Diethylenglycoldimethylether, Triethylenglycoldimethylether und Gemischen aus diesen.

19. Verfahren nach einem der Ansprüche 1 bis 18, **dadurch gekennzeichnet, dass** das Verfahren in Gegenwart eines Phasen-Transfer Katalysators durchgeführt wird, wobei der Phasen-Transfer Katalysator bevorzugt ausgewählt ist aus einem quartären Ammoniumsalz, Tetraalkylphosphoniumchlorid, Tetraalkylphosphoniumbromid und Gemischen aus diesen, wobei der Phasen-Transfer Katalysator bevorzugt ein Tetraalkylammoniumsalz oder ein Trialkylarylammoniumsalz ist, mehr bevorzugt ist der Phasen-Transfer Katalysator ausgewählt aus der Gruppe umfassend Benzyltrimethylammonium Hydroxid, Benzyltrietyhlammonium Chlorid, Tetrabutylammonium Chlorid, Tetrabutylammonium Bromid, Tetrabutylammonium Hydrogensulfat, Tetrabutylammonium Hydroxid, Methyltrioctylammonium Chlorid, Cetyl Pyridinium und Gemischen aus diesen.

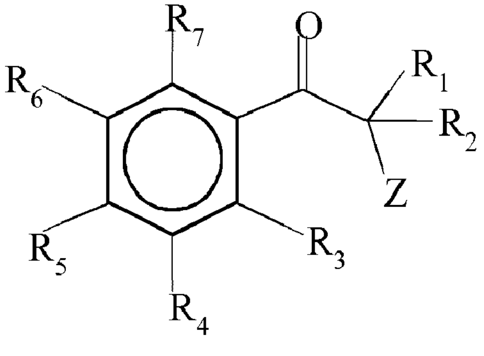
20. Verfahren nach einem der Ansprüche 1 bis 19, **dadurch gekennzeichnet, dass** das $\alpha$-funktionalisierte Keton in einer Eintopfreaktion erhalten wird.

21. Verfahren nach einem der Ansprüche 1 bis 20, **dadurch gekennzeichnet, dass** das Verfahren den zusätzlichen Schritt

    i) Trennung der erhaltenen organischen und wässrigen Phasen, und/oder
    ii) Extrahieren der erhaltenen wässrigen Phase mit dem organischen Lösungsmittel welches im Verfahren verwendet wurde und vereinigen der erhaltenen organischen Phasen, und/oder
    iii) Ansäuern der erhaltenen organischen Phase auf einen pH-Wert von 3 bis 6,5.

## Revendications

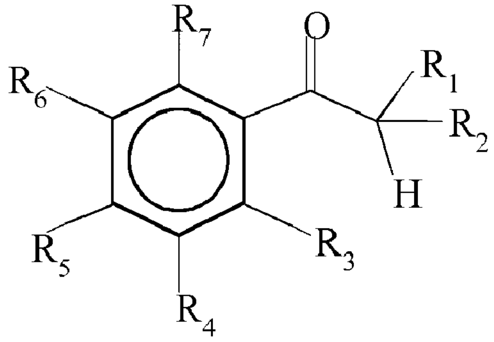
1. Procédé pour la préparation d'une cétone $\alpha$-fonctionnalisée de formule générale I,



I

dans laquelle $R_1$ et $R_2$ sont identiques ou différents et sont indépendamment choisis parmi H, alkyle en $C_1$ à $C_8$

linéaire ou ramifié, cycloalkyle en $C_3$ à $C_8$, alcényle en $C_2$ à $C_8$ linéaire ou ramifié, cycloalcényle en $C_5$ à $C_8$, alcynyle en $C_2$ à $C_8$ linéaire ou ramifié, aryle en $C_6$ à $C_{14}$, ou forment un cycloalkyle en $C_3$ à $C_{12}$ ou cycloalcényle en $C_5$ à $C_{12}$ conjointement avec l'atome C de connexion ;
$R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ sont identiques ou différents et sont indépendamment choisis parmi H, alkyle en $C_1$ à $C_8$ linéaire ou ramifié, alcényle en $C_2$ à $C_8$ linéaire ou ramifié, alcoxy en $C_1$ à $C_8$, alcényloxy en $C_2$ à $C_8$, cycloalkyle en $C_3$ à $C_8$, aryle en $C_6$ à $C_{14}$, cycloalcoxy en $C_3$ à $C_8$, arylalcoxy en $C_7$ à $C_{15}$, alcénylarylalcoxy en $C_9$ à $C_{15}$, $N(R_8)_2$ ou $SR_8$ où $R_8$ est choisi parmi alkyle en $C_1$ à $C_8$ linéaire ou ramifié, alcényle en $C_2$ à $C_8$ linéaire ou ramifié, aryle en $C_6$ à $C_{14}$, alcoxy en $C_1$ à $C_8$, alcényloxy en $C_2$ à $C_8$, cycloalkyle en $C_3$ à $C_8$, cycloalcoxy en $C_3$ à $C_8$, arylalcoxy en $C_7$ à $C_{15}$, alcénylarylalcoxy en $C_9$ à $C_{15}$, ou bien les $R_8$ forment un système alicyclique en $C_3$ à $C_9$ conjointement avec l'atome N de connexion, optionnellement un ou plusieurs atomes de carbone sont remplacés par O, ou bien deux R adjacents forment un système aromatique conjointement avec le cycle benzène de la formule I ;
Z est choisi parmi $OR_9$, $NHR_9$ et $NR_{10}R_{11}$ où $R_9$, $R_{10}$ et $R_{11}$ sont indépendamment choisis parmi H, alkyle en $C_1$ à $C_8$ linéaire ou ramifié, alcényle en $C_2$ à $C_8$ linéaire ou ramifié, alcoxy en $C_1$ à $C_8$, alcényloxy en $C_2$ à $C_8$, cycloalkyle en $C_3$ à $C_8$, cycloalcoxy en $C_3$ à $C_8$, aryle en $C_6$ à $C_{14}$, arylalkyle en $C_7$ à $C_{15}$, arylalcoxy en $C_7$ à $C_{15}$, alcénylarylalcoxy en $C_9$ à $C_{15}$, alcénylarylalkyle en $C_9$ à $C_{15}$ ; ou bien $R_{10}$ et $R_{11}$ forment un système alicyclique en $C_3$ à $C_9$ conjointement avec l'atome N ou C de connexion, optionnellement un ou plusieurs atomes de carbone sont remplacés par 0 ;
**caractérisé en ce qu'**une cétone de formule générale II



II

dans laquelle $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ sont tels que définis ci-dessus, est mise en contact dans des conditions de transfert de phase avec un alcane en $C_2$ à $C_8$ et/ou alcène en $C_2$ à $C_8$ au moins partiellement halogéné, et

i) une base choisie dans le groupe comprenant un hydroxyde de métal alcalin, un hydroxyde de métal alcalino-terreux, un alkylate en $C_1$ à $C_8$ de métal alcalin, un alkylate en $C_1$ à $C_8$ de métal alcalino-terreux, et leurs mélanges, ou
ii) une base choisie dans le groupe comprenant un hydroxyde de métal alcalin, un hydroxyde de métal alcalino-terreux, un alkylate en $C_1$ à $C_8$ de métal alcalin, un alkylate en $C_1$ à $C_8$ de métal alcalino-terreux, et leurs mélanges, conjointement avec la forme protonée de Z tel que défini ci-dessus.

2. Procédé selon la revendication 1, **caractérisé en ce que** $R_1$ et $R_2$ sont identiques.

3. Procédé selon la revendication 2, **caractérisé en ce que** $R_1$ et $R_2$ sont choisis parmi H et alkyle en $C_1$ à $C_8$ linéaire ou ramifié, de préférence alkyle en $C_1$ à $C_8$ linéaire ou ramifié, plus préférablement alkyle en $C_1$ à $C_4$ linéaire ou ramifié et le plus préférablement alkyle en $C_1$ à $C_3$ linéaire.

4. Procédé selon la revendication 1, **caractérisé en ce que** $R_1$ et $R_2$ sont différents et sont indépendamment choisis parmi H et alkyle en $C_1$ à $C_8$ linéaire ou ramifié, de préférence alkyle en $C_1$ à $C_8$ linéaire ou ramifié, plus préférablement alkyle en $C_1$ à $C_4$ linéaire ou ramifié et le plus préférablement alkyle en $C_1$ à $C_3$ linéaire.

5. Procédé selon la revendication 1, **caractérisé en ce que** $R_1$ et $R_2$ forment un cycloalkyle en $C_4$ à $C_{10}$ de préférence cycloalkyle en $C_4$ à $C_8$, et le plus préférablement cycloalkyle en $C_6$, conjointement avec l'atome C de connexion.

6. Procédé selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** $R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ sont identiques.

7. Procédé selon la revendication 6, **caractérisé en ce que** $R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ sont choisis parmi H et alkyle en $C_1$

à $C_8$ linéaire ou ramifié, de préférence alkyle en $C_1$ à $C_6$ linéaire ou ramifié, plus préférablement alkyle en $C_1$ à $C_4$ linéaire ou ramifié et le plus préférablement alkyle en $C_1$ à $C_3$ linéaire.

**8.** Procédé selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** $R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ sont différents et au moins l'un d'eux est choisi parmi alkyle en $C_1$ à $C_8$ linéaire ou ramifié, alcényle en $C_2$ à $C_8$ linéaire ou ramifié, alcoxy en $C_1$ à $C_8$, alcényloxy en $C_2$ à $C_8$, alcénylarylalcoxy en $C_9$ à $C_{15}$, $N(R_8)_2$ et $SR_8$, où $R_8$ est choisi parmi alkyle en $C_1$ à $C_8$ linéaire ou ramifié et alcényle en $C_2$ à $C_8$ linéaire ou ramifié, ou bien les $R_8$ forment un système alicyclique en $C_3$ à $C_9$ conjointement avec l'atome N de connexion.

**9.** Procédé selon l'une quelconque des revendications 1 à 5 et 8, **caractérisé en ce que** l'un parmi $R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ est un alcényle en $C_2$ à $C_8$ linéaire ou ramifié, de préférence alcényle en $C_2$ à $C_6$ et le plus préférablement alcényle en $C_2$ à $C_3$ ; alcoxy en $C_1$ à $C_8$, de préférence alcoxy en $C_1$ à $C_6$ et le plus préférablement alcoxy en $C_1$ à $C_3$ ; alcényloxy en $C_2$ à $C_8$, de préférence alcényloxy en $C_2$ à $C_6$ et le plus préférablement alcényloxy en $C_3$ à $C_5$ ; alcénylarylalcoxy en $C_9$ à $C_{15}$, de préférence alcénylarylalcoxy en $C_9$ à $C_{12}$ et le plus préférablement alcénylarylalcoxy en $C_9$ à $C_{10}$ ; ou $N(R_8)_2$ ou $SR_8$ où $R_8$ est choisi parmi alkyle en $C_1$ à $C_8$ linéaire ou ramifié et alcényle en $C_2$ à $C_8$ linéaire ou ramifié, ou bien les $R_8$ forment un système alicyclique en $C_3$ à $C_9$ conjointement avec l'atome N de connexion ; et ceux restants sont indépendamment choisis parmi H et alkyle en $C_1$ à $C_8$ linéaire ou ramifié, de préférence alkyle en $C_1$ à $C_6$ linéaire ou ramifié, plus préférablement alkyle en $C_1$ à $C_4$ linéaire ou ramifié et le plus préférablement alkyle en $C_1$ à $C_3$ linéaire.

**10.** Procédé selon l'une quelconque des revendications 1 à 5 et 8, **caractérisé en ce que** deux ou trois parmi $R_3$, $R_4$, $R_5$, $R_6$ et $R_7$ sont un alcényle en $C_2$ à $C_8$ linéaire ou ramifié, de préférence alcényle en $C_2$ à $C_6$ et le plus préférablement alcényle en $C_2$ à $C_3$ ; alcoxy en $C_1$ à $C_8$, de préférence alcoxy en $C_1$ à $C_6$ et le plus préférablement alcoxy en $C_1$ à $C_3$ ; alcényloxy en $C_2$ à $C_8$, de préférence alcényle en $C_2$ à $C_6$ et le plus préférablement alcényloxy en $C_3$ à $C_5$ ; alcénylarylalcoxy en $C_9$ à $C_{15}$, de préférence alcénylarylalcoxy en $C_9$ à $C_{12}$ et le plus préférablement alcénylarylalcoxy en $C_9$ à $C_{10}$, et ceux restants sont indépendamment choisis parmi H et alkyle en $C_1$ à $C_8$ linéaire ou ramifié, de préférence alkyle en $C_1$ à $C_6$ linéaire ou ramifié, plus préférablement alkyle en $C_1$ à $C_4$ linéaire ou ramifié et le plus préférablement alkyle en $C_1$ à $C_3$ linéaire.

**11.** Procédé selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** $R_3$ et $R_4$ ou $R_4$ et $R_5$ forment un système aromatique conjointement avec le cycle benzène de la formule I, de préférence un système aromatique bicyclique, tricyclique ou tétracyclique, plus préférablement un système aromatique choisi parmi les systèmes naphtyle, anthracényle et phénanthrényle.

**12.** Procédé selon la revendication 11, **caractérisé en ce que** l'un des R restants est un alcényle en $C_2$ à $C_8$ linéaire ou ramifié, de préférence alcényle en $C_2$ à $C_6$ et le plus préférablement alcényle en $C_2$ à $C_3$ ; alcényloxy en $C_2$ à $C_8$, de préférence alcényloxy en $C_2$ à $C_6$ et le plus préférablement alcényloxy en $C_3$ à $C_5$ ; ou alcénylarylalcoxy en $C_9$ à $C_{15}$, de préférence alcénylarylalcoxy en $C_9$ à $C_{12}$ et le plus préférablement alcénylarylalcoxy en $C_9$ à $C_{10}$ ; et ceux restants sont indépendamment choisis parmi H et alkyle en $C_1$ à $C_8$ linéaire ou ramifié, de préférence alkyle en $C_1$ à $C_6$ linéaire ou ramifié, plus préférablement alkyle en $C_1$ à $C_4$ linéaire ou ramifié et le plus préférablement alkyle en $C_1$ à $C_3$ linéaire.

**13.** Procédé selon l'une quelconque des revendications 1 à 12, **caractérisé en ce que** Z est $OR_9$ où $R_9$ est choisi parmi H, alkyle en $C_1$ à $C_8$ linéaire ou ramifié, alcényle en $C_2$ à $C_8$ linéaire ou ramifié, alcoxy en $C_1$ à $C_8$, alcényloxy en $C_2$ à $C_8$, cycloalkyle en $C_3$ à $C_8$, cycloalcoxy en $C_3$ à $C_8$, arylalcoxy en $C_7$ à $C_{15}$ et alcénylarylalcoxy en $C_9$ à $C_{15}$, de préférence $R_9$ est H ou Z est $NR_{10}R_{11}$ où $R_{10}$ et $R_{11}$ sont indépendamment choisis parmi H, alkyle en $C_1$ à $C_8$ linéaire ou ramifié, cycloalkyle en $C_3$ à $C_8$, aryle en $C_6$ à $C_{14}$, ou bien $R_{10}$ et $R_{11}$ forment un système alicyclique en $C_3$ à $C_6$ conjointement avec l'atome N de connexion, optionnellement un ou plusieurs atomes de carbone sont remplacés par O, de préférence $R_{10}$ et $R_{11}$ forment un système alicyclique en $C_5$ à $C_6$ conjointement avec l'atome N de connexion et un ou plusieurs atomes de carbone sont remplacés par O.

**14.** Procédé selon l'une quelconque des revendications 1 à 13, **caractérisé en ce que** l'alcane en $C_2$ à $C_8$ et/ou alcène en $C_2$ à $C_8$ au moins partiellement halogéné est complètement halogéné, de préférence l'alcane en $C_2$ à $C_8$ et/ou alcène en $C_2$ à $C_8$ est choisi parmi l'hexachloroéthane, le tétrachloroéthylène et leurs mélanges.

**15.** Procédé selon l'une quelconque des revendications 1 à 14, **caractérisé en ce que** la base est choisie dans le groupe comprenant l'hydroxyde de sodium ; l'hydroxyde de lithium ; l'hydroxyde de potassium ; un alkylate de sodium en $C_1$ à $C_6$, de préférence un alkylate de sodium en $C_1$ à $C_4$ et le plus préférablement un alkylate de sodium en $C_1$ à $C_2$ ; un alkylate de lithium en $C_1$ à $C_6$, de préférence un alkylate de lithium en $C_1$ à $C_4$ et le plus préférablement un alkylate de lithium en $C_1$ à $C_2$ ; un alkylate de potassium en $C_1$ à $C_6$, de préférence un alkylate de potassium en $C_1$ à $C_4$ et le plus préférablement un alkylate de potassium en $C_1$ à $C_2$ ; et leurs mélanges ; ou bien la base est choisie parmi un alkylate de sodium en $C_1$ à $C_6$, de préférence un alkylate de sodium en $C_1$ à $C_4$ et le plus préférablement un alkylate de sodium en $C_1$ à $C_2$ ; un alkylate de potassium en $C_1$ à $C_6$, de préférence un alkylate de potassium en $C_1$ à $C_4$ et le plus préférablement un alkylate de potassium en $C_1$ à $C_2$, conjointement avec la forme protonée de Z tel que défini ci-dessus.

**16.** Procédé selon l'une quelconque des revendications 1 à 14, **caractérisé en ce que** la base est sous la forme d'une solution aqueuse ou bien la base est disposée dans un solvant organique, de préférence le solvant organique est choisi dans le groupe comprenant le méthanol, l'éthanol, le n-propanol, le tert-butanol, le dichlorométhane, le tétrachloroéthylène, le tétrahydrofurane, l'acétate d'éthyle, l'acétone, le N,N-diméthylformamide, le diméthylsulfoxyde, le dioxane, tel que le 1,3-dioxane ou le 1,4-dioxane, le 1,2-diméthoxyéthane, l'éther diméthylique de diéthylèneglycol, l'éther diméthylique de triéthylèneglycol et leurs mélanges.

**17.** Procédé selon l'une quelconque des revendications 1 à 16, **caractérisé en ce que** le procédé est mis en œuvre à une température d'au moins 30°C, de préférence dans la plage de 30 à 120°C, plus préférablement dans la plage de 40 à 100°C, et le plus préférablement dans la plage de 40 à 90°C.

**18.** Procédé selon l'une quelconque des revendications 1 à 17, **caractérisé en ce que** le procédé est mis en œuvre dans un solvant organique, de préférence le solvant organique est choisi dans le groupe comprenant le méthanol, l'éthanol, le n-propanol, le tert-butanol, le dichlorométhane, le tétrachloroéthylène, le tétrahydrofurane, l'acétate d'éthyle, l'acétone, le N,N-diméthylformamide, le diméthylsulfoxyde, le dioxane, tel que le 1,3-dioxane ou le 1,4-dioxane, le 1,2-diméthoxyéthane, l'éther diméthylique de diéthylèneglycol, l'éther diméthylique de triéthylèneglycol et leurs mélanges.

**19.** Procédé selon l'une quelconque des revendications 1 à 18, **caractérisé en ce que** le procédé est mis en œuvre en présence d'un catalyseur de transfert de phase, de préférence le catalyseur de transfert de phase est choisi parmi un sel d'ammonium quaternaire, un chlorure de tétraalkylphosphonium, un bromure de tétraalkylphosphonium et leurs mélanges, de préférence le catalyseur de transfert de phase est un sel de tétraalkylammonium ou un sel de trialkylarylammonium, plus préférablement le catalyseur de transfert de phase est choisi dans le groupe comprenant l'hydroxyde de benzyltriméthylammonium, le chlorure de benzyltriéthylammonium, le chlorure de tétrabutylammonium, le bromure de tétrabutylammonium, l'hydrogénosulfate de tétrabutylammonium, l'hydroxyde de tétrabutylammonium, le chlorure de méthyltrioctylammonium, le cétylpyridinium et leurs mélanges.

**20.** Procédé selon l'une quelconque des revendications 1 à 19, **caractérisé en ce que** la cétone $\alpha$-fonctionnalisée est obtenue dans une réaction monotope.

**21.** Procédé selon l'une quelconque des revendications 1 à 20, **caractérisé en ce que** le procédé comprend en outre une étape de

i) séparation des phases organique et aqueuse obtenues, et/ou
ii) extraction de la phase aqueuse obtenue avec le solvant organique utilisé dans le procédé et combinaison des phases organiques obtenues, et/ou
iii) acidification de la phase organique obtenue à un pH de 3 à 6,5.

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description

- DE 2722264 **[0002]**
- US 4740624 A **[0002] [0003]**
- WO 2006034066 A1 **[0003]**
- WO 2004099262 A1 **[0163] [0164]**

### Non-patent literature cited in the description

- **GARY JING CHUANG et al.** A Dinuclear Palladium Catalyst for α-Hydroxylation of Carbonyls with O2. *J. Am. Chem. Soc.,* 2011, vol. 133, 1760-1762 **[0002]**
- **CHENGQUN CHEN et al.** An Efficient Method for the Synthesis of α-Hydroxyalkyl Aryl Ketones. *Synthesis,* 2008, vol. 20, 3205-3208 **[0002]**
- **MAREK KOPROWSKI et al.** Asymmetric oxidation of enol phosphates to α-hydroxy ketones by (salen)manganese(III) complex; Effects of the substitution pattern of enol phosphates on the stereochemistry of oxygen transfer. *Tetrahedron,* 2006, vol. 62, 12363-12374 **[0002]**
- **FRANKLIN A. DAVIS et al.** Oxidation of Silyl Enol Ethers Using 2-Sulfonyloxaziridines; Synthesis of α-Siloxy Epoxides and α-Hydroxy Carbonyl Compounds. *J. Org. Chem.,* 1987, vol. 52, 954-955 **[0002]**
- **YU-FENG LIANG et al.** Highly Efficient C-H Hydroxylation of Carbonyl Compounds with Oxygen under Mild Conditions. *Angew. Chem.,* 2014, vol. 126, 558-562 **[0002]**
- **YU-FENG LIANG et al.** I2- or NBS-Catalyzed Highly Efficient αHydroxylation of Ketones with Dimethyl Sulfoxide. *Org. Lett.,* 2015, vol. 17, 876-879 **[0002]**
- α-hydroxylation of enolates and silyl enol ethers. **BANG-CHI CHEN et al.** Organic Reactions. John Wiley & Sons, Inc, 2003, vol. 62 **[0002]**