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(54) Cleaning composition, method for producing a cleaning composition, and method for cleaning a surface

(57) The invention relates to a cleaning composition, the composition comprising a mixture of:
- a first component comprising a water soluble presolvent;
- a second component of selected from the group of dibasic esters such as dialkyl methylglutarate, dialkyl adipate, dialkyl ethylsuccinate, dialkyl succinate, dialkyl glutarate and any combination thereof, and preferably selected from said dibasic esters; and
- a third component, selected from the group of sulfosuccinates or oils such as PEG-40 hydrogenated castor oil, including any combination thereof

such that significant dilution of the mixture of the first, second and third component with water provides a clear and stable emulsion.

The invention further relates to method for producing a cleaning composition, and a method for cleaning a surface with the cleaning composition.

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Description

[0001] The invention relates to a cleaning composition, a method for producing a cleaning composition, and a method for cleaning a surface.

[0002] Cleaning compositions are available for a wide range of applications. Most of the currently available cleaning solutions are volatile organic compounds (VOCs) which are increasingly associated with toxicity, and are therefore undesirable. In addition, their disposal is cumbersome and expensive. Alternative cleaning compositions used may be compositions comprising dibasic esters such as dialkyl methylglutarate, dialkyl adipate, dialkyl ethylsuccinate, dialkyl succinate, dialkyl glutarate or a combination thereof.

[0003] Dibasic esters are however still difficult and costly to dispose in their concentrated form because they cannot be diluted with water since they become unstable and show phase separation when mixed with water. They should therefore be disposed via separate collection facilities. Dibasic esters are also relatively expensive in comparison to for instance water, whereas their possible reduction in function when significantly diluted with water is not significant enough to be relevant, especially when used with some way of mechanical force, such as brushing or pouring. It is however therefore even preferred to be able to dilute dibasic esters with water which is impossible due to the phase separation upon the addition of water which may impede its suitability and effectiveness as a cleaning composition.

[0004] It is therefore an object of the invention to reduce or even obviate the above stated drawbacks.

[0005] This object is achieved with a cleaning composition, the composition comprising a mixture of:

- a first component comprising a water soluble presolvent;
- a second component of selected from the group of dibasic esters such as dialkyl methylglutarate, dialkyl adipate, dialkyl ethylsuccinate, dialkyl succinate, dialkyl glutarate and any combination thereof, and preferably selected from said dibasic esters; and
- a third component, selected from the group of sulfosuccinates or oils such as PEG-40 hydrogenated castor oil, including any combination thereof

such that significant dilution of the mixture of the first, second and third component with water provides a clear and stable emulsion.

[0006] Without being bound to this theory, it is believed that, surprisingly, the first, second and third component added together form a milky or opaque oil-in-oil composition, which gradually moves via a water-in-oil emulsion (which is most often opaque)towards a clear oil-in-water emulsion which is stable when significantly diluting the composition with water beyond a cloud point. Some compositions when not yet diluted with water may also be clear when mixed, for instance when mixed freshly, however these solutions will become milky or opaque over time.

[0007] The presolvent may be any component that is able to distribute the second and third upon mixing of the second and third component. It may not be equal to the second or the third component or water.

[0008] The term stable refers to a composition which does not show phase separation after mixing over a period preferably in the order days, more preferably in the order of weeks, even more preferably in the order of months, most preferably in the order of years.

[0009] The term emulsion refers to a liquid composition with at least two liquid phases which is homogeneous, preferably on at least a microscopic level, but possibly also on a nanoscale.

[0010] The term milky refers to a composition which is white and nontransparent. The term opaque refers to a composition which is at least partly transparent but not colorless. The term clear refers to a composition which is both transparent and colorless.

[0011] The term significant dilution with water refers to a dilution beyond the cloud point, at which cloud point the composition turns into a clear and stable emulsion. In those compositions, approximately 30 percent by weight of the total composition is water. Preferably, the composition comprises more than 60 percent water by weight of the total composition, more preferably more than 80 percent water by weight of the total composition and most preferably more than 99 percent water by weight of the total composition (near-infinite dilution). 99 percent water may also mean 99.9, 99.99, 99.999 or 99.9999 percent of water by weight of the total composition.

[0012] The third component may be provided in a typical solvent. It may take more time for the composition to become stable and clear when the solvent has evaporated during the process of mixing, for instance, because of its volatility.

[0013] Volatile ingredients (VOCs) which may be used when making the composition, such as solvents for the third component, may be neglected for the characteristics of the final products, since they may be substantially removed from the composition by exposure to air.

[0014] The term water refers to any water, e.g. tap water or distilled water.

[0015] The pH of the composition is preferably between 4.5 and 6.5 upon a dilution from approximately 40 to approximately 80 percent by weight of water. The pH may however also be adjusted according to specific needs, e.g. by the use of a buffering agent.

[0016] Other additives may also be added during the method, such as for instance fragrances or preservatives, such as biocides, e.g. acticide, as well as other additives which are known for such cleaning compositions.

[0017] The cleaning composition may be sold or provided as such, i.e. not significantly diluted with water, since it reduces the size of the container which has to be used, also reducing the costs for transporting the composition to a user.

[0018] However, in a preferred embodiment of the cleaning composition according to the invention, the cleaning composition is significantly diluted with water.

[0019] It may be preferred to significantly dilute the cleaning composition as such because it allows for a preset determination of the recommended dilution, which increases the ease of use.

[0020] The cleaning compositions without dilution with water are not clear and/or instable by itself, but become clear and stable only after significant dilution with water. In this embodiment, the user will be able to also use small amounts from a container, since it may be required for the user to fully use the contents of one container in one instance when the composition is not clear or instable. This further increases the ease of use and reduces the amount of cleaning composition used.

[0021] The cleaning composition may also be provided diluted to a certain amount, preferably an amount in which the composition is clear and stable, after which the user is instructed to dilute the composition even further before or after application.

[0022] In a further preferred embodiment of the cleaning composition according to the invention, the first component comprises at least one presolvent selected from the group of glycol ethers.

[0023] It has been found that presolvents chosen from the group of glycol ethers are especially suitable for producing a clear and stable cleaning composition in the form of an emulsion after significant dilution with water. The first component may also include any mixture of glycol ethers.

[0024] In another preferred embodiment of the cleaning composition according to the invention, the first component comprises butyl glycol, butyl diglycol or any combination thereof.

[0025] It has been found that glycol ethers chosen from the group of butyl glycol, butyl diglycol and any combination thereof are especially suitable for producing a clear and stable cleaning composition in the form of an emulsion after significant dilution with water. In addition, the fact that butyl glycol and butyl diglycol are not regarded as flammable, makes them suitable for a cleaning composition.

[0026] In yet another preferred embodiment of the cleaning composition according to the invention, the third component comprises di-2-ethylhexyl sulfosuccinate.

[0027] It has been found that sulfosuccinates comprising di-2-ethylhexyl sulfosuccinate are especially suitable for producing a clear and stable cleaning composition in the form of an emulsion after significant dilution with water. This third component may, as mentioned, be provided in a typical solvent, e.g. as Serwet WH 170.

[0028] In even another preferred embodiment of the cleaning composition according to the invention, the ratio between the weight of the second component and the sum of the weight of the first and the third component is equal or smaller than 1.03 : 1.00, more preferably equal or smaller than 1.026 : 1.000.

[0029] It has been found that cleaning compositions with ratios of the second component to the first and third component equal or smaller than 1.03 : 1.00, more preferably equal or smaller than 1.026 : 1.000 are especially clear and stable emulsions after significant dilution with water. This is in particular the case when the first component is chosen from the group of butyl glycol, butyl diglycol and any combination thereof, and when the third component comprises di-2-ethylhexyl sulfosuccinate.

[0030] In again another preferred embodiment of the cleaning composition according to the invention, the ratio between the weight of the second component and the sum of the weight of the first and the third component is equal or larger than 1.00 : 1.00, more preferably equal or larger than 1.000 : 1.000.

[0031] It has been found that cleaning compositions with ratios of the second component to the first and third component equal or larger than 1.00 : 1.00, more preferably equal or larger than 1.000 : 1.000 are especially clear and stable emulsions when significantly diluted with water. This is in particular the case when the first component is chosen from the group of butyl glycol, butyl diglycol and any combination thereof, and when the third component comprises di-2-ethylhexyl sulfosuccinate.

[0032] In another preferred embodiment of the cleaning composition according to the invention, the ratio between the weight of the first component and the third component is equal or smaller than 1.8 : 1.0, preferably equal or smaller than 1.79 : 1.00, more preferably equal or smaller than 1.785 : 1.000.

[0033] It has been found that cleaning compositions with ratios of the first to the third component equal or smaller than 1.8 : 1.0, preferably equal or smaller than 1.79 : 1.00, more preferably equal or smaller than 1.786 : 1.000 are especially clear and stable emulsions when significantly diluted with water. This is in particular the case when the first component is chosen from the group of butyl glycol, butyl diglycol and any combination thereof, and when the third component comprises di-2-ethylhexyl sulfosuccinate.

[0034] The object of the invention is further achieved with a method for producing a cleaning composition according to the invention, wherein the mixing of the first, second and third component comprising the steps of:

- providing a composition comprising a first component comprising a water soluble presolvent, including any combination thereof;
- mixing the composition with a second component of selected from the group of dibasic esters such as dialkyl methylglutarate, dialkyl adipate, dialkyl ethylsuccinate, dialkyl succinate, dialkyl glutarate and any combination thereof, and preferably selected from said dibasic esters; and
- mixing the composition with a third component, selected from the group of sulfosuccinates or oils such as PEG-40 hydrogenated castor oil, including any combination thereof

[0035] While the cleaning composition may be made in any way conceivable, it is especially found that a suitable composition is obtained when the first and the third component mixed, after which this mixture may then be mixed with the second component. However, it is for instance also possible to mix the first and second component followed by the mixing the composition with the third component.

[0036] The term mixing is not restricted to mixing by mechanical means, such as stirring, but may also include shaking, including gently shaking, possibly by hand.

[0037] Where applicable, the composition, comprising the first, second and third component, may for instance be diluted with water.

[0038] The object of the invention is further achieved with a method for cleaning a surface, comprising the steps of:

- providing a cleaning composition according to the invention, at least significantly diluted with water;
- applying the cleaning composition on a surface comprising a contamination; and
- removing the cleaning composition and the contamination after application.

[0039] In its diluted form, the cleaning composition is a clear and stable emulsion which can therefore be used effectively in order to clean a surface comprising a contamination. The dilution with water may take place before the application to the surface, but it may also be diluted wholly or partially after application.

[0040] The application may comprise one or more of the steps of dipping the surface in the cleaning composition, brushing or application of a cloth provided with the cleaning composition.

[0041] In a preferred embodiment of the method for cleaning a surface according to the invention, the application of the cleaning composition comprises the step of spraying the cleaning composition.

[0042] Because the cleaning composition is a clear and stable emulsion, it may readily be applied by spraying the composition in its diluted form without loss of its effectiveness.

[0043] In yet another preferred embodiment of the method for cleaning a surface according to the invention, the application of the cleaning composition comprises the step of dispensing a covering layer of the cleaning composition on top of the surface.

[0044] The cleaning composition may also be dispensed on a surface in order to clean the surface. Cleaning by dispensing is especially preferred with a relatively increased level of contamination. Preferably, the surface is provided with an edge or curvature in order to prevent the composition from leaking from the surface.

[0045] In this embodiment, the cleaning composition may be either prediluted (diluted with water before dispensing) or diluted on the surface. It may also be diluted by a combination of these strategies.

[0046] In again another preferred embodiment of the method for cleaning a surface according to the invention, the removing of the cleaning composition comprises the step of rinsing the surface with water.

[0047] The cleaning composition according to the invention is stable when significantly diluted with water. The ease of removal of the cleaning composition after use is therefore reduced, since it is readily removable with water. Especially when rinsed with water, the concentration of the other components is relatively low, decreasing the concentrations of the other components when disposed in the environment, thereby making the ways of disposing more flexible.

[0048] In yet another preferred embodiment of the method for cleaning a surface according to the invention, the removing of the cleaning composition comprises the step of substantially decanting the cleaning composition from the surface.

[0049] While the cleaning composition according to the invention may be disposed in the environment, it may be possible to remove the contamination from the surface in such a way that the contamination will detach from the surface, after which it will move together with the cleaning composition. In this case, it may be preferred to remove the cleaning composition by decanting, since it may be possible to substantially isolate the contamination form the cleaning composition relatively easily.

[0050] In even another preferred embodiment of the method for cleaning a surface according to the invention, the contamination comprises a resin such as epoxy resin or polyester resin.

[0051] It has been found that the cleaning compositions according to the invention are especially suitable for cleaning surfaces with contaminations such as epoxy resin, polyester resin as well as other such resins, especially when these resins are soft.

Example 1

[0052] Mixtures of di-2-ethylhexyl sulfosuccinate and butyl glycol in different weight ratios were added to RPDE from Rhodiasolv (a mixture of dimethyl glutarate, dimethyl adipate and dimethyl succinate). The resulting composition was gently shaken by hand. Tap water was gradually added to the compositions. Dependent on the weight ratio of di-2-ethylhexyl sulfosuccinate to butyl glycol and the weight ratio of the sum of di-2-ethylhexyl sulfosuccinate and butyl glycol to RPDE, the composition turned from milky via opaque to clear, or from opaque to clear after the addition of a certain amount of water. Addition of water was gradually continued until the tap water content by weight was 99.9 percent, or for as long as the composition remained stable. As an comparative example, a mixture of di-2-ethylhexyl sulfosuccinate and butyl glycol was also diluted with tap water according to the same procedure.

[0053] The results are shown in Table 1 in which column A denotes the weight of the RPDE, column B denotes the weight of the di-2-ethylhexyl sulfosuccinate, column C denotes the weight of butyl glycol, wherein the fourth and fifth column denote the weight ratios between the according components. The sixth column denotes the range of the water percentage of the total composition in which the total composition was clear and stable, showing no phase separation. A percentage of 99.9 means near-infinite dilution.

[0054] The first three entries show that the composition remains unstable over the whole range from 0 - 99.9 percent dilution with water, whereas the following eight entries show the development of the range in which the composition turns stable upon dilution with water.

[0055] Similar results were obtained with similar products from ViVoChem, BASF or Chempri/Mosselman (Helisol).

Table 1

A [kg]	B [kg]	C [kg]	A/ (B+C) [kg/kg]	B/C [kg/kg]	%H_2O-clear [kg/kg]
50.30	3.500	6.250	5.159	1.786	none
20.00	3.500	6.250	2.051	1.786	none
16.00	3.500	6.250	1.641	1.786	none
19.00	6.125	10.90	1.116	1.780	34.5 - 56.8
12.00	3.500	6.250	1.231	1.786	37.9 - 65.5
17.50	6.125	10.90	1.028	1.780	34.8 - 73.4
10.00	3.000	7.000	1.000	2.333	42.8 - 90.2
17.50	8.750	8.750	1.000	1.000	42.8 - 99.9
10.00	3.500	6.250	1.026	1.786	40.1 - 99.9
50.30	17.70	31.60	1.020	1.785	36.2 - 99.9
21.00	8.000	12.50	1.024	1.563	32.5 - 99.9
-	8.000	12.50	n/a	1.563	0 - 99.9

Example 2

[0056] A mixture 25 kg of di-2-ethylhexyl sulfosuccinate and 25 kg of butyl glycol was added to 50 kg IRIS from Rhodiasolv (containing dimethyl methylglutarate). The resulting composition was gently shaken by hand. Tap water was added to the compositions and the amount of tap water was gradually increased thereafter for as long as the composition remained stable. The composition was dilutable from approximately 30 percent by weight of the total composition to 99.9 percent (near-infinite dilution).

Example 3

[0057] A mixture 5 kg of Eumulgin HRE-40 (PEG-40 hydrogenated castor oil) and 20 kg of butyl glycol was added to 10 kg IRIS from Rhodiasolv (containing dimethyl methylglutarate). The resulting composition was gently shaken by hand. Tap water was added to the compositions and the amount of tap water was gradually increased thereafter for as long as the composition remained stable. The composition was dilutable from approximately 30 percent by weight of the total composition to 99.9 percent (near-infinite dilution).

Example 4

[0058] Compositions have been made from

1) RPDE from RhodiaSolv and butyl diglycol in a 1.6 : 1 weight ratio;
2) RPDE from RhodiaSolv and di-2-ethylhexyl sulfosuccinate in a 2.9 : 1 weight ratio;
3) RPDE from RhodiaSolv, butyl diglycol and di-2-ethylhexyl sulfosuccinate in a 2.9 : 1.8 : 1 weight ratio; and
4) RPDE from RhodiaSolv, butyl diglycol and di-2-ethylhexyl sulfosuccinate in a 2.9 : 1.8 : 1 weight ratio diluted with 70 percent tap water by weight of the total composition.

[0059] The compositions are shown in the respective Figures 1 to 4. Compositions 1 and 2 show phase separation at the dashed line. Composition 3 is not clear, especially near the bottom. Composition 4 is a clear and stable emulsion.
[0060] Similar results were obtained with similar products from ViVoChem, BASF or Chempri/Mosselman (Helisol).

Claims

1. Cleaning composition, the composition comprising a mixture of:

- a first component comprising a water soluble presolvent;
- a second component of selected from the group of dibasic esters such as dialkyl methylglutarate, dialkyl adipate, dialkyl ethylsuccinate, dialkyl succinate, dialkyl glutarate and any combination thereof, and preferably selected from said dibasic esters; and
- a third component, selected from the group of sulfosuccinates or oils such as PEG-40 hydrogenated castor oil, including any combination thereof

such that significant dilution of the mixture of the first, second and third component with water provides a clear and stable emulsion.

2. Cleaning composition according to claim 1, wherein the cleaning composition is significantly diluted with water.

3. Cleaning composition according to claim 1 or 2, wherein the first component comprises at least one presolvent selected from the group of glycol ethers.

4. Cleaning composition according claim 3, wherein the first component comprises butyl glycol, butyl diglycol or any combination thereof.

5. Cleaning composition according to any of the preceding claims, wherein the third component comprises di-2-ethylhexyl sulfosuccinate.

6. Cleaning composition according to any of the preceding claims, wherein the ratio between the weight of the second component and the sum of the weight of the first and the third component is equal or smaller than 1.03 : 1.00, more preferably equal or smaller than 1.026 : 1.000.

7. Cleaning composition according to claim 6, wherein the ratio between the weight of the second component and the sum of the weight of the first and the third component is equal or larger than 1.00 : 1.00, more preferably equal or larger than 1.000 : 1.000.

8. Cleaning composition according to any of the preceding claims, wherein the ratio between the weight of the first component and the third component is equal or smaller than 1.8 : 1.0, preferably equal or smaller than 1.79 : 1.00, more preferably equal or smaller than 1.785 : 1.000.

9. Method for producing a cleaning composition according to any of the preceding claims, wherein the mixing of the first, second and third component comprising the steps of:

- providing a composition comprising a first component comprising a water soluble presolvent, including any combination thereof;
- mixing the composition with a second component of selected from the group of dibasic esters such as dialkyl

methylglutarate, dialkyl adipate, dialkyl ethylsuccinate, dialkyl succinate, dialkyl glutarate and any combination thereof, and preferably selected from said dibasic esters; and
- mixing the composition with a third component, selected from the group of sulfosuccinates or oils such as PEG-40 hydrogenated castor oil, including any combination thereof

10. Method for cleaning a surface, comprising the steps of:

- providing a cleaning composition according to any of the claims 1 to 8, at least significantly diluted with water;
- applying the cleaning composition on a surface comprising a contamination; and
- removing the cleaning composition and the contamination after application.

11. Method for cleaning a surface according to claim 10, wherein the application of the cleaning composition comprises the step of spraying the cleaning composition.

12. Method for cleaning a surface according to claim 10, wherein the application of the cleaning composition comprises the step of dispensing a covering layer of the cleaning composition on top of the surface.

13. Method for cleaning a surface according to claim 10, 11 or 12, wherein the removing of the cleaning composition comprises the step of rinsing the surface with water.

14. Method for cleaning a surface according to claim 10, 11 or 12, wherein the removing of the cleaning composition comprises the step of substantially decanting the cleaning composition from the surface.

15. Method for cleaning a surface according to any of the claims 10 to 14, wherein the contamination comprises a resin such as epoxy resin or polyester resin.

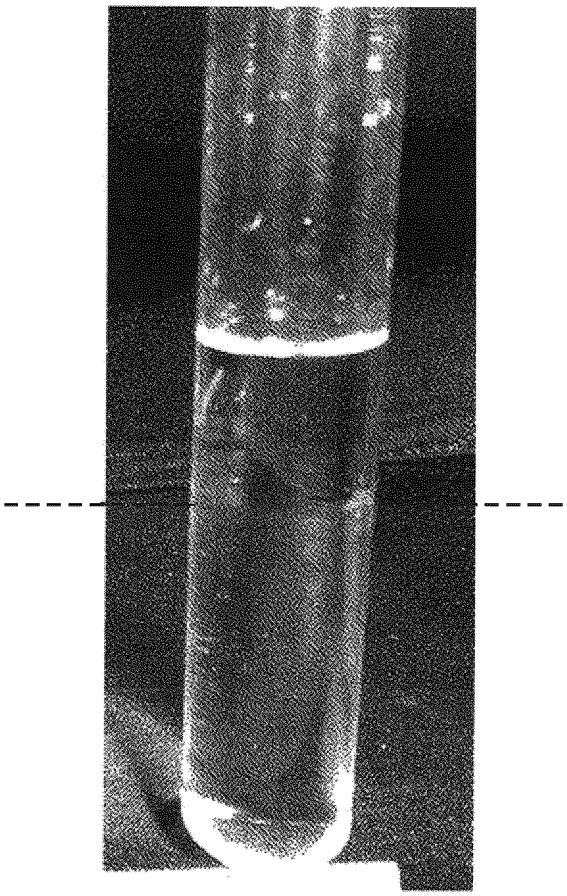

Fig. 1

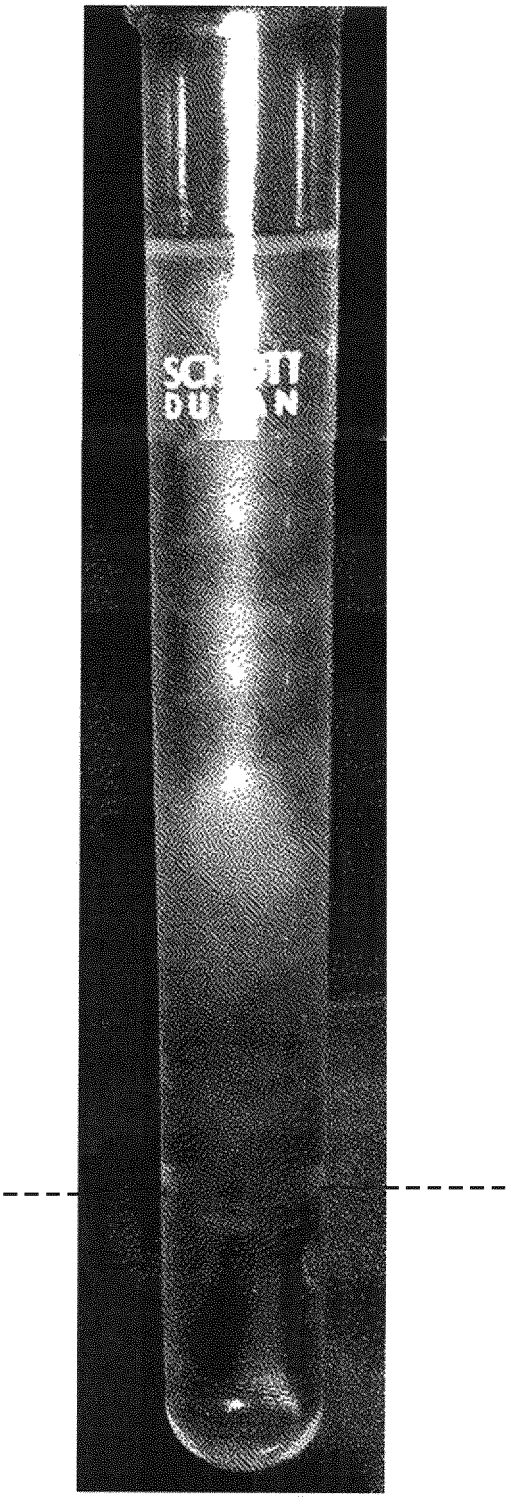

Fig. 2

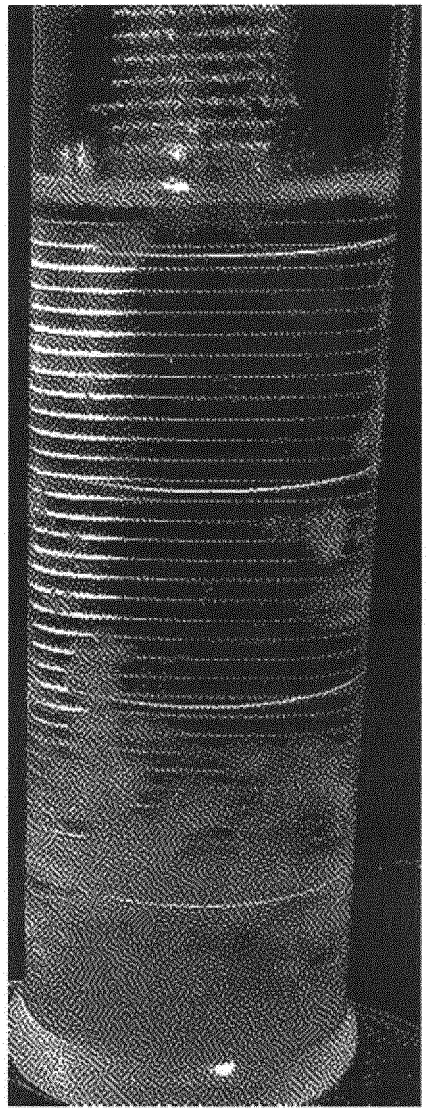

Fig. 3

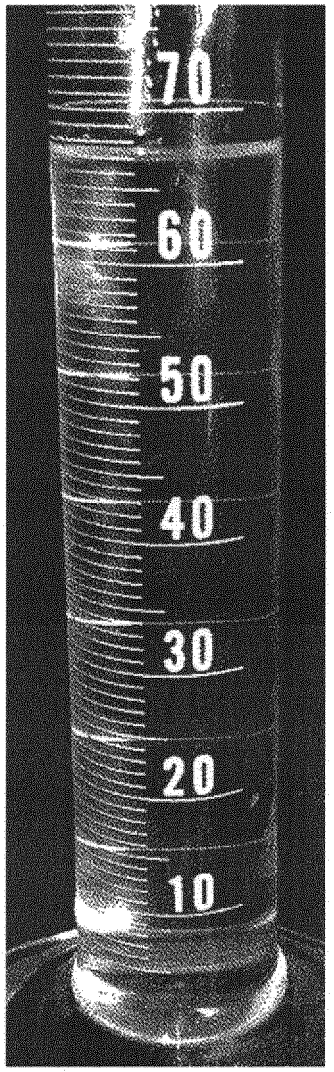

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 1670

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 June 2015	Richards, Michael

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-06-2015

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