

(19)



(11)

EP 2 505 688 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

03.10.2012 Bulletin 2012/40

(51) Int Cl.:

C23C 18/12 (2006.01)

(21) Application number: **12158143.3**

(22) Date of filing: **05.03.2012**

(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**

Designated Extension States:

BA ME

(30) Priority: **28.03.2011 IT AN20110039**

(71) Applicant: **Alluflon S.p.A.**
61100 Pesaro (IT)

(72) Inventor: **Montagna, Michele**
61100 PESARO (IT)

(74) Representative: **Baldi, Claudio**
Ing. Claudio Baldi S.r.l.
Viale Cavallotti, 13
60035 Jesi (Ancona) (IT)

(54) **Decoration method for a cooking vessel**

(57) A decoration method of a cooking vessel at least partially coated with SOL-GEL type ceramic coating is disclosed, wherein said decorative pattern is applied on said SOL-GEL ceramic coating maintaining a tempera-

ture of the cooking vessel comprised between 50° and 80°C during a step of application of the decorative pattern.

EP 2 505 688 A1

Description

[0001] The present invention relates to a decoration method of a cooking vessel, such as a pot or similar vessel, and to a cooking vessel obtained according to said method.

[0002] In general, it is known that some types of cooking vessels can be coated with a nonstick protective film.

[0003] A very common film is made of fluoropolymers (i.e. PTFE); such type of film can be easily decorated with any pattern, as disclosed for example in the US 5,707,688 patent which teaches the application of a stone-like decoration on cookware provided with said coating.

[0004] In spite of being functional, the fluoropolymer coating film is impaired by several drawbacks: for example, it can be easily scratched by sharp objects, thus cutting the coating and preventing the use of the cookware.

[0005] Therefore, alternative solutions to such a type of fluoropolymer coating have been devised, being characterized by higher resistance.

[0006] One of said alternative solutions is described in patent applications MC2009A000176 and AN2010A000191 in the name of Alluflon s.r.l.

[0007] Briefly, such an alternative solution provides for using a nanotechnological ceramic product of hybrid organic-inorganic type obtained with SOL-GEL technique.

[0008] Such a product combines the nonstick and chemical resistance properties of an organic coating with the excellent hardness and thermal behavior of an inorganic ceramic coating. A detailed description of said coating is contained in the aforementioned patent applications by the same applicant and will be briefly described hereinafter.

[0009] It must be simply noted that the realization of decorative patterns on such a ceramic coating is impaired by some problems that prevent using the technique that is typically used to decorate the fluoropolymer coating.

[0010] The above is mainly due to the different nature of the two materials and to the viscosity of the ceramic coating during the fabrication of the cooking vessel, which negatively affects the application of a decoration made by spraying.

[0011] The decor particles risk to be incorporated in the coating, without sticking to it, thus impairing the final decoration.

[0012] Special attention must be paid to the fact that, unlike the fluoropolymer coating, a cooking vessel where ceramic coating is sprayed needs to be heated in order to cause the chemical reactions that determine the formation of the coating.

[0013] Such a heating affects so much viscosity that, briefly, the application of the method disclosed in the US 5,707,688 patent to a cookware with SOL-GEL ceramic coating is not satisfactory in terms of decor endurance.

[0014] WO2008/142327 discloses a method for application of a SOL-GEL decorative layer on a nonstick background of cooking utensils. Such a process provides for heating the cooking utensil at high temperatures comprised between 180 and 350°C.

[0015] The purpose of the present invention is to devise a decoration method of a cooking vessel (such as a pot, a frying pan, a baking tray or similar vessels) provided with SOL-GEL ceramic coating.

[0016] According to the precepts of the present invention, the decorative patterns applied on the cooking vessels are obtained by spraying paint products that are homologous or identical to the ones used for the background coating, i.e. of SOL-GEL ceramic type.

[0017] A particular type of decorative pattern provides for making a matrix of small dots of different colors in such manner to obtain a decor with final aspect similar to natural stone.

[0018] Referring to the SOL-GEL ceramic material used both for coating and pigmentation, said coating and said pigmentation are formed, aggregated and developed directly on the support (aluminum or metal of cooking vessel), originating from nanometric particles (10^{-9} m, one millionth of a millimeter), unlike traditional porcelain enamel that originates from powders with dimensions thousands of times higher that melt to form a vitreous film.

[0019] Such coating and pigmentation are obtained from an organic liquid in alcoholic solution, called "SOL" that, after some chemical reactions, once it is sprayed on the part and baked in the oven, is first converted into "GEL" and then into a ceramic by means of alcohol evaporation.

[0020] The reactions of the SOL-GEL technique are known to the expert of the art, and therefore the present description only contains a brief mention, both referring to the scientific theory in general and to the other patent applications by the same application for further information and discussion.

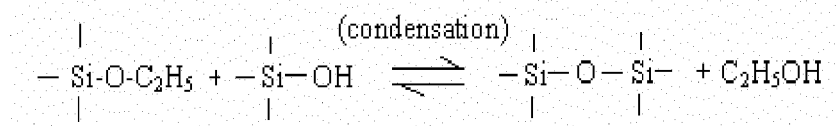
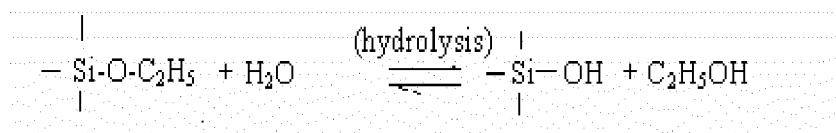
[0021] Briefly, the term "SOL-GEL" indicates a colloidal suspension able to solidify, forming a gel that is then heated to form oxides with high purity.

[0022] Such a technique is known and used to produce ceramics, parts by means of casting, aerogels and very thin coatings of metal oxides.

[0023] The SOL is composed of solid particles with diameter of few hundreds of nanometers, usually metal inorganic salts, silicon in this case, suspended in liquid phase.

[0024] In a typical SOL-GEL process, from a colloidal suspension (SOL), a series of hydrolysis and polymerization reactions bring the particles to a new phase, called GEL.

[0025] The general diagram of the reactions of the SOL-GEL technique, which cause the formation of coating, is as follows:



[0026] The material of the coating and over-applied pigmentation is silicate (therefore, of ceramic type) and has the typical characteristics of a similar coating, such as:

- nonstickness: it is characterized by high compactness, absence of porosity and high hydrophobicity of surface, and is nonstick since food cannot stick to coating when it starts burning.
- high temperature resistance: it does not decompose and does not get damaged if exposed to high temperatures for long; moreover, even in case of overheating, it does not generate fumes, and resists excellently to thermal shocks;
- adhesion and scratch resistance: it adheres on any type of aluminum provided with suitable roughness profile or other metal material used to make the bottom and coat, and has an excellent resistance to scratches;
- chemical resistance: it resists to washing with soap also in dishwasher, high temperatures and saline corrosion tests;
- resistance to abrasion: it resists to traditional abrasion tests.
- finally, it polymerizes in a drying oven at 200°C saving on energy costs, and reducing carbon dioxide (CO₂) emissions in the environment.

[0027] Moreover, when compared to a traditional PTFE coating, it guarantees higher crunchiness characteristics for the food cooked/heated in it; additionally, it guarantees better heating of food inside it.

[0028] As mentioned, such a coating is normally applied inside the cooking vessel by spraying after the original aluminum disk is drawn into the desired shape and suitably surface-treated.

[0029] In general lines, the method of the invention provide for the application of a decorative pattern on a SOL-GEL ceramic coating maintaining a temperature of the cooking vessel comprised between 50° and 80°C during the application of the decorative pattern.

[0030] In particular, the method of the invention comprises the following steps:

- a) Preparation of internal and/or external surface of said cooking vessel so that it has a surface roughness profile suitable for application of SOL-GEL type silicate-based ceramic coating;
- b) Heating of said cooking vessel at temperature comprised between 50°C and 80°C,
- c) Application of said SOL-GEL ceramic coating on said internal and/or external surface of said cooking vessel by means of spraying in one or more layers until 10 ÷ 60 μm thickness is obtained;
- d) Spray application of at least one first pigmentation color and simultaneous maintenance of the vessel temperature basically at the same value as the one in step b);
- e) Spray application of upper transparent protective layer;
- f) Firing to fix coating and pigmentation.

[0031] Step a) above is preferably made by means of sandblasting and the surface roughness profile is such that Ra is approximately 5 ± 1 μm with a good distribution of high and low peaks.

[0032] With reference to preheating under step b) above, the temperature is preferably comprised between 60 ° and 70 °C.

[0033] The thickness of coating under step c) above is preferably comprised between 20 and 50 μm.

[0034] It must be noted that, advantageously, the pre-heating temperature of the cooking vessel, also maintained during the spraying of the pigment, allows for maintaining the viscosity of the already applied coating at such values that the single droplets of the decorative pigment do not sink completely in the background layer and maintain their punctiform aspect.

[0035] Further variants of the contents of the description are possible.

[0036] For example, according to certain variants, the method of the present invention comprises the following additional step:

d1) Spray application of a second pigmentation color and simultaneous maintenance of the temperature value under step b) above.

[0037] Step d1) is performed between step d) and step e).

[0038] Also in this case, the maintenance of the desired temperature allows the droplets of the second pigment to fix perfectly, without sinking in the coating and maintaining their circular shape.

[0039] Such a method can be indifferently applied both on the inside and outside of the cooking vessels; if pigmentation is used on both the internal and external surface, and is made to give a natural stone-like decor to the cooking vessel, the aspect of the cooking vessel is very similar to a cooking vessel obtained from a single block of natural stone with great aesthetic appeal.

[0040] The coverage percentage of the dots of the pigmentation color in association with the shape of the individual dots gives a final aspect that is very similar to natural stone.

[0041] It is also possible to apply additional pigmentation colors with techniques similar to the one described above.

[0042] In view of the above, table 1 below indicates the recommended coverage percentages of the area of the cooking vessel where said effect is to be obtained:

table 1

punctiform coating	% coverage of background area
first color	20 ÷ 70
second color	20 ÷ 40
any additional colors	5 ÷ 30

[0043] Moreover, further variants of the basic method illustrated herein are possible, for instance to obtain additional or different decorations, while still falling within the protection scope of the present invention.

[0044] A further object of the present invention is a cooking vessel for food obtained according to said method.

[0045] Such a cooking vessel is easily recognizable because of the SOL-GEL ceramic coating, which is more difficult to scratch with a sharp object and, if scratched, tends to break differently from a PTFE coating. In fact, in the case of a SOL-GEL ceramic coating, the painted surface tends to chip rather than cut clearly.

[0046] Moreover, according to the method of the present invention, pigmentation by spraying makes each cooking vessel different, with random, not repeatable painting.

Claims

1. Decoration method of a cooking vessel at least partially coated with SOL-GEL type ceramic coating, comprising a step of application of a decorative pattern on said SOL-GEL ceramic coating,
characterized in that a temperature of the cooking vessel comprised between 50° and 80°C is maintained during said step of application of the decorative pattern.

2. Method as claimed in the preceding claim, **characterized in that** said decorative pattern consists in pigmentation by means of SOL-GEL type ceramic paint.

3. Method as claimed in claim 1 or 2, **characterized in that** it comprises the following steps:

a) Preparation of internal and/or external surface of said cooking vessel so that it has a surface roughness profile suitable for application of SOL-GEL type silicate-based ceramic coating;

b) Heating of said cooking vessel at temperature comprised between 50°C and 80°C,

c) Application of said SOL-GEL ceramic coating on said internal and/or external surface of said cooking vessel by means of spraying in one or more layers until 10 ÷ 60 μm thickness is obtained;

d) Spray application of at least one first pigmentation color and simultaneous maintenance of the vessel temperature basically at the same value as the one in step b);

e) Spray application of upper transparent protective layer;

f) Firing to fix coating and pigmentation.

4. Method as claimed in claim 3, **characterized in that** step a) comprises a sandblast phase.

EP 2 505 688 A1

5. Method as claimed in claim 3 or 4, **characterized in that** the temperature of said heating is comprised between 60° and 70°C.

6. Method as claimed in claim 3, 4 or 5, **characterized in that** said coating thickness as per step c) is comprised between 20 and 50 μm .

7. Method as claimed in one of claims 3 to 6, **characterized in that** it comprises the following additional step:

d1) Spray application of a second pigmentation color and simultaneous maintenance of the temperature as per step b); said step d1) being performed between said steps d) and e).

8. Method as claimed in one of claims 3 to 7, **characterized in that** said first and/or second pigmentation color are applied in punctiform mode.

9. Method as claimed in the above claim, **characterized in that** coverage percentages of the area of the cooking vessel where said decoration is to be obtained are comprised between 20% and 70% for said first pigmentation color, between 20% and 40% for said second pigmentation color and between 5% and 30% for any additional pigmentation colors.



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 8143

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2008/142327 A2 (SEB SA [FR]; PERILLON, JEAN-LUC [FR]; DUBANCHET, AURELIEN [FR]) 27 November 2008 (2008-11-27) * page 14, line 31 - page 16, line 5; claims 1,24-27; example 15 * -----	1	INV. C23C18/12
A	WO 2007/104258 A1 (CERASOL HONG KONG LTD [CN]; JEON BONG YEOL [KR]; KIM SANG MOK [KR]) 20 September 2007 (2007-09-20) * page 10, line 4 - page 11, line 9 * -----	1	
A	DE 103 20 779 A1 (DEGUSSA AG [DE]) 18 November 2004 (2004-11-18) * paragraph [0016] - paragraph [0040] * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			C23C A47J
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 July 2012	Examiner Innecken, Axel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 15 8143

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-07-2012

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2008142327 A2		27-11-2008	CN 101663368 A	03-03-2010
			EP 2139964 A2	06-01-2010
			FR 2915205 A1	24-10-2008
			JP 2010525095 A	22-07-2010
			KR 20100016632 A	12-02-2010
			US 2010181322 A1	22-07-2010
			WO 2008142327 A2	27-11-2008

WO 2007104258 A1		20-09-2007	CA 2581474 A1	14-09-2007
			EP 1835002 A2	19-09-2007
			WO 2007104258 A1	20-09-2007

DE 10320779 A1		18-11-2004	AT 332763 T	15-08-2006
			AU 2003266489 A1	26-11-2004
			BR 0318290 A	30-05-2006
			CN 1771096 A	10-05-2006
			DE 10320779 A1	18-11-2004
			EP 1622729 A1	08-02-2006
			ES 2266924 T3	01-03-2007
			JP 4469728 B2	26-05-2010
			JP 2006525134 A	09-11-2006
			KR 20060009920 A	01-02-2006
			US 2006204767 A1	14-09-2006
			WO 2004098795 A1	18-11-2004

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

- US 5707688 A [0003] [0013]
- WO 2008142327 A [0014]