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(54) Decoration method for a cooking vessel
Dekorationsverfahren für ein Kochgefäss
Procédé de décoration pour un récipient de cuisson

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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.

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

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.

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.

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

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

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

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.

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.

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.

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

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.

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.

WO2008/142327 discloses a method for application of a SOL-GEL decorative layer on a nonstick background of cooking utensils as defined in the preamble of claim 1. Such a process provides for heating the cooking utensil at high temperatures comprised between 180 and 350°C.

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.

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.

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.

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 (10⁻⁹m, 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.

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.

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.

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.

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

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.

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.

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

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SOL -> GEL -> Ceramic
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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:

- nonstickiness: 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.

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.

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.

In general lines, the method of the invention provides 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.

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 10−4 to 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.

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.

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

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

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.

Further variants of the contents of the description are possible.

For example, according to certain variants, the method of the present invention comprises the following additional step:
Step d1) is performed between step d) and step e).

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.

Such a method can be indifferentely 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.

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.

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.

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.

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.

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

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.

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 type 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 to 60 micrometer 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.
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 at least one first mentation 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.

Patentansprüche


3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass es folgende Schritte umfasst:

   a) Vorbereitung der Innen- und/oder Außenfläche des Behälters, damit dieser eine für die Applikation einer Keramikbeschichtung auf Silicium-Basis des Typs SOL-GEL geeignetes Oberflächenrauheitsprofil aufweist;
   b) Erhitzung des Behälters auf eine Temperatur zwischen 50°C und 80°C;
   c) Applikation der SOL-GEL-Keramikbeschichtung auf der Innen- und/oder Außenfläche des Kochbehälters durch Aufsprühen einer oder mehrerer Schichten bis zum Erreichen einer Dicke von 10⁻⁶ 60 μm;
   d) Aufsprühen von mindestens einer ersten Pigmentierungsfarbe und gleichzeitiges Halten der Temperatur des Behälters etwa auf dem gleichen Wert wie in Schritt b);
   e) Aufsprühen einer transparenten Oberschutzschicht;
   f) Fixationsbrennen der Beschichtung und der Pigmentierung.

4. Verfahren nach Anspruch 3, dadurch gekennzeichnet, dass der Schritt a) eine Phase des Sandstrahlens umfasst.

5. Verfahren nach Anspruch 3 oder 4, dadurch gekennzeichnet, dass die Temperatur des Erhitzens im Bereich zwischen 60°⁻⁷ 70°C liegt.

6. Verfahren nach Anspruch 3, 4 oder 5, dadurch gekennzeichnet, dass die Dicke der Beschichtung gemäß Schritt c) zwischen 20⁻⁵ 50 μm liegt.

7. Verfahren nach einem der Ansprüche 3 bis 6, dadurch gekennzeichnet, dass es den zusätzlichen Schritt umfasst:

   d1) Aufsprühen einer zweiten Pigmentierungsfarbe und gleichzeitiges Halten der Temperatur gemäß Schritt b), wobei Schritt d1 zwischen den Schritten d) und e) ausgeführt wird.

8. Verfahren nach einem der Ansprüche 3 bis 7, dadurch gekennzeichnet, dass die erste und/oder die zweite Pigmentierungsfarbe punktförmig aufgetragen werden.
Verfahren nach dem vorstehenden Anspruch, dadurch gekennzeichnet, dass die Prozentsätze der Abdeckung des Behälterbereiches, auf dem die Dekoration gewünscht wird, zwischen 20% und 70% für die erste Pigmentierungsfarbe, zwischen 20% und 40% für die zweite Pigmentierungsfarbe und zwischen 5% und 30% für eventuelle weitere Pigmentierungsfarben betragen.

Revendications

1. Méthode pour la décoration d’un récipient de cuisson revêtu au moins partiellement par un revêtement en céramique du type SOL-GEL, comprenant une phase d’application d’un motif décoratif sur ledit revêtement en céramique du type SOL-GEL, caractérisée en ce que durant ladite phase d’application du motif décoratif, la température du récipient est maintenue dans une plage de 50° - 80°C.

2. Méthode selon la revendication précédente, caractérisée en ce que ledit motif décoratif est une pigmentation obtenue moyennant une peinture céramique du type SOL-GEL.

3. Méthode selon les revendications 1 ou 2, caractérisée en ce qu’elle comprend les étapes suivantes :
   a) Préparation de la surface interne et/ou externe du dit récipient de manière à ce qu’elle assume un profil superficiel rugueux idoine à l’application d’un revêtement en céramique à base de silicates du type SOL-GEL ;
   b) Réchauffement du dit récipient à une température comprise dans la plage 50°C et 80°C ;
   c) Application du dit revêtement en céramique SOL-GEL sur ladite surface interne et/ou externe du dit récipient de cuisson moyennant pulvérisation d’une ou de plusieurs couches, jusqu’à obtenir une épaisseur comprise entre 10–60 μm ;
   d) Application par pulvérisation d’au moins une première couleur de pigmentation et maintien simultané de la température du récipient à une valeur pratiquement égale à celle de l’étape b) ;
   e) Application par pulvérisation d’une couche de protection transparente de finition ;
   f) Cuisson pour la fixation du revêtement et de la pigmentation.

4. Méthode selon la revendication 3, caractérisée en ce que ladite étape a) comprend une phase de sablage.

5. Méthode selon les revendications 3 ou 4, caractérisée en ce que ladite température du dit réchauffement est comprise dans une plage de 60° – 70°C.

6. Méthode selon les revendications 3, 4 ou 5, caractérisée en ce que ladite épaisseur du revêtement dont à l’étape c) est comprise dans une plage de 20–50 μm.

7. Méthode selon l’une des revendications de 3 à 6, caractérisée en ce qu’elle prévoit l’étape supplémentaire :
   d1) qui prévoit l’application par pulvérisation d’une seconde couleur de pigmentation et le maintien simultané de la température dont à l’étape b) ; cette étape d1 étant effectuée entre lesdites étapes d) et e).

8. Méthode selon l’une des revendications de 3 à 7, caractérisée en ce qu’au moins l’une des dites couleurs de pigmentation soient appliquées de manière punctiforme.

9. Méthode selon la revendication précédente, caractérisée en ce que les pourcentages de couverture de la surface du récipient sur lequel on veut obtenir ladite décoration sont compris entre 20% et 70% pour ladite première couleur de pigmentation, entre 20% et 40% pour ladite seconde couleur de pigmentation et entre 5% et 30% pour les éventuelles couleurs supplémentaires de pigmentation.
REFERENCES CITED IN THE DESCRIPTION

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