

CEIPI – Example solution Paper A2026

Claims

1. Sol-gel composition for coating cookware (10), comprising TEOS and citric acid, characterised by a ratio by weight of between 1:1 and 6:1 of TEOS to citric acid.
2. Sol-gel composition according to claim 1, wherein the ratio by weight of TEOS to citric acid is 4:1.
3. Method for applying a coating (20) to the cooking surface of cookware (10), comprising the steps of
 - (a) providing a sol-gel composition according to claim 1 or claim 2,
 - (b) applying the sol-gel composition to the cooking surface, and
 - (c) drying and densifying the sol-gel composition in an oven at temperatures above 250°C.
4. Method according to claim 3, wherein the sol-gel composition is applied using a sprayer (30) which is automatically controlled by a control system to move within the geometrical boundaries of the cooking surface and to apply the sol-gel composition to the substrate (21) of the whole cooking surface.
5. Method according to claim 4, wherein the sprayer (30) is adapted to apply the sol-gel coating to the substrate at moving speeds between 0.1 and 0.8 m/s.
6. Method according to any of claims 3 to 5, wherein the sol-gel composition according to claim 2 is applied to a cooking surface (20b) horizontal during use of the cookware (10).
7. Method according to claim 6, wherein a sol-gel composition with a ratio by weight of between 2:1 of TEOS to citric acid is applied to cooking surfaces (20a) non-horizontal during use of the cookware (10).
8. Method according to claim 7, wherein the sol-gel composition according to claim 2 is applied by spraying the sol-gel composition orthogonally to the cooking surface (20b) horizontal during use of the cookware (10) and the sol-gel composition with a ratio by weight of between 2:1 of TEOS to citric acid is subsequently applied to the cooking surfaces (20a) non-horizontal during use of the cookware (10) by spraying the sol-gel composition horizontally.
9. Cookware (10), comprising a metal substrate (21), characterised in that the metal substrate (21) is coated with a sol-gel coating (20) obtained by applying the method according to any of claims 3 to 8.
10. Cookware (10) according to claim 9, wherein the substrate (21) is aluminium.

11. Cookware (10) according to claim 9 or claim 10, wherein the substrate comprises an aluminium upper layer (21) to which the coating (20) is applied, and a lower layer (22) underneath the aluminium upper layer (21) comprising another metal.
12. Cookware (10) according to claim 11, wherein the lower layer (22) comprises stainless steel or iron.
13. Cookware (10) according to any of claims 9 to 12, wherein the coating (20) has a hardness of 12-15 measured according to the ISO 14705 norm of 31.12.2016.
14. Cookware (10) according to claim 13, wherein the coating (20) has a hardness of 15.
15. Cookware (10) according to any of claims 9 to 14, wherein the cookware (10) is a frying pan, cooking pot, wok, pressure cooker, raclette kit, air fryer, waffle maker, baking tray, barbecue grill or plancha plate.

Description

The invention is concerned with cookware. The invention also relates to a method for applying a coating to the cooking surface of cookware and to a sol-gel composition for coating the cookware.

Cookware is normally provided with a cooking surface that has non-stick properties.

Document D1, which is comprised in the prior art, discloses the use of Teflon™ as a reliable and easy to manufacture non-scratch coating. However, despite the care taken by customers in using only non-abrasive cooking utensils on cookware, it has been found that scratches inevitably appear on the coated cooking surfaces at the latest after a couple of years of use, and this negatively affects their non-stick function. In recent years, awareness has been raised regarding the serious effects of Teflon™ on consumer health and on the environment. Teflon™ emits toxic, potentially carcinogenic substances when heated at cooking temperatures. These effects are even more pronounced if the Teflon™ surface is scratched. Furthermore, Teflon™ has a very long half-life and therefore degrades extremely slowly in the environment. At the end of the cookware life cycle, the Teflon™ residues of these Teflon™-coated materials remain in the environment as “forever-chemicals”, with serious consequences for the ecosystems concerned.

Document D2, which is also comprised in the prior art, discloses the use of sol-gel coatings of metal surfaces in aeronautics and aerospace. Their anti-corrosion and liquid repellent properties together with their excellent hardness and scratch resistance in extreme weather conditions make them the ideal protective layer for the great diversity of metal surface used in such industries. Since sol-gel coatings also have food contact standard, D2 also suggests their use for cookware such as pans, pots or any other food container.

The object of the invention is to develop cookware comprising a non-stick, scratch-resistant and non-toxic coated surface.

According to independent claim 9, this object is achieved by cookware obtained by applying a coating method according to independent claim 3 comprising applying a coating to the cookware by using a sol-gel composition comprising TEOS (tetraethylorthosilicate) and citric acid, with a ratio by weight of between 1:1 and 6:1 of TEOS to citric acid, as claimed in independent claim 1.

Applying a sol-gel coating to a cooking surface instead of Teflon™ achieves particularly good non-stick properties, even better than Teflon™. Moreover, the scratch resistance and general durability are improved. The inorganic sol-gel compositions used for coating our cooking surfaces have no adverse health effects and are non-toxic for the environment.

The sol-gel composition according to dependent claim 2 gives the best results in terms of scratch resistance and non-stick properties.

The various method steps according to dependent claims 4 to 8 and the additional features of the cookware according to dependent claims 10 to 14 all contribute to achieving optimum results in terms of scratch resistance and non-stick properties.

Dependent claim 15 claims specific examples of cookware that advantageously may be provided with the coating according to the invention.