

Method for removing substrates provided with organic coatings

The invention relates to a method for removing organic coatings from substrates, the organic coating having been applied by means of ionogenic gel formation, and recycling of the substrate and also where possible of the detached coating.

Currently, it is not financially viable, or is only feasible with difficulty, to remove the deposited varnish layer(s) of dip-coated substrate before firing. Defectively coated substrates are generally disposed of or have to be reworked in costly processes. The document DE 10 2013 201 966 A1 discloses a novel method for coating metallic surfaces and the coating systems used for this purpose, by which a dispersion of film-forming polymers and an anionic polyelectrolyte in the form of an ionogenic gel is deposited by cations dissolved out of the metallic surface. The entire content of the aforementioned document should form part of the present application. The coating systems described therein are designated, in the context of this application, as universal dip coats.

The object of the embodiments disclosed herein is to provide a method by which the organic coating formed by ionogenic gel formation can be removed again from the substrate surface by various chemicals, optionally by a dipping or spraying process, and the substrate can be reintegrated into the process chain for a repeated coating.

According to the disclosure the method for removing a substrate that is coated with an organic coating by means of ionogenic gel formation is carried out by treating a wet or dry organic coating that has not yet formed a film on the substrate with an aqueous solution of a metal salt from main group I in the periodic table of the elements, a complexing agent and/or a basic compound having a pH value > 10.

In an aspect, there is provided a method for removing organic coatings from substrates, which a wet or dry organic coating was applied on by means of ionogenic gel formation, characterized in that the wet or dry organic coating that has not yet formed a film on the substrate is treated with an aqueous solution comprising:

i) a polyethyleneimine;

- ii) a metal salt from main group I in the periodic table of the elements and a polyethyleneimine; or
- iii) a basic compound having a pH value > 10 and a polyethyleneimine.

The removal is preferably carried out using a dipping or spraying process.

An aqueous solution of at least one metal salt of the elements Li, Na and K as well as preferably Na and K is preferably used.

Alternatively, a complexing agent is used which undergoes substantial complexing with iron, zinc, magnesium and aluminum, preferably EDTA and/or polyethylenimine.

As a further alternative, aqueous solutions of NaOH, KOH and/or NH₃ are used as basic compounds.

The thickness of the coatings to be removed can range from a few nm to several µm. Preferably, however, the thickness of the coating to be removed ranges from 1 µm to 100 µm, particularly preferably 5 µm to 35 µm. In individual cases, such as for example a process shutdown or a contamination of the dip bath with metal ions, it is also possible to clean complete baths or blocked pipelines.

The concentration of the solution used is at least 5% w/w. However, a concentration between 10% and 70% w/w is preferably used. The range is particularly preferably between 20% and 45% w/w. The substances used can be combined in any ratios into aqueous formulations.

Particularly preferably, the removal of wet films can be carried out.

According to the invention, after the removal of the ionogenic gel coating the substrate can be used for coating again.

A pre-treatment by alkaline cleaning is preferably carried out before the substrate obtained is coated again.

Furthermore, the method according to the invention has the advantage that it enables the reconditioning of the detached coating. The resulting dispersion can be used again for ionogenic gel deposition on metallic surfaces. The recycling of the detached and dissolved coating can be assisted by concentration and/or neutralization. The resulting washing solution can be used either for reformulations or for already existing baths.

The invention is explained in greater detail below with reference to three examples without the invention being limited thereby to these examples.

Example 1

bases

- NaOH 10%
- KOH 10%
- NH_3 15-25%

Example 2

competing metal ions

- KCl
- NaCl
- K_2CO_3 10%
- Na_2CO_3 10%
- K_2SO_4 10%

Example 3

complexing agents

- Lupasol G20 15%
- Lupasol FG 15%
- EDTA (ethylene diamine tetraacetate)

The substances specified in the examples are prepared in aqueous formulations in the specified percentages by weight attached. Then substrates coated with an organic coating in terms of the ionogenic gel formation are dipped into the produced solutions and if required are swiveled slightly until the coating dissolves or is detached.

Claims

1. A method for removing organic coatings from substrates, which a wet or dry organic coating was applied on by means of ionogenic gel formation, characterized in that the wet or dry organic coating that has not yet formed a film on the substrate is treated with an aqueous solution comprising:
 - i) a polyethyleneimine;
 - ii) a metal salt from main group I in the periodic table of the elements and a polyethyleneimine; or
 - iii) a basic compound having a pH value > 10 and a polyethyleneimine.
2. The method according to claim 1, characterized in that the removal is carried out using a dipping or spraying process.
3. The method according to claim 1, characterized in that the aqueous solution comprises at least one metal salt of the elements Li, Na or K, and preferably Na or K is used.
4. The method according to claim 1, characterized in that the complexing agents undergo substantial complexing with iron, zinc, magnesium or aluminum, and preferably EDTA and/or polyethylenimine are used.
5. The method according to claim 1, characterized in that aqueous solutions of NaOH, KOH and/or NH₃ are used as basic compounds.
6. The method according to claims 1 to 5, characterized in that the concentration of the solution used is at least 5% w/w.
7. The method according to claim 6, characterized in that the concentration is between 10% and 70% w/w.
8. The method according to claim 6 or 7, characterized in that the concentration is between 20% and 45% w/w.
9. The method according to claims 1 to 8, characterized in that the removal of wet films is carried out.

10. The method according to claims 1 to 9, characterized in that the thickness of the coatings to be removed ranges from a few nm to several μm , preferably 1 μm to 100 μm , particularly preferably 5 μm to 35 μm .
11. The method according to claims 1 to 10, characterized in that after the removal of the organic coating the substrate can be used for coating again.
12. The method according to claim 11, characterized in that a pre-treatment can be carried out before the substrate obtained is coated again.

Method for removing substrates provided with organic coatings

The invention relates to a method for removing a substrate that is coated with an organic coated coating by means of ionogenic gel formation. In said method, a wet or dry organic coating that has not yet formed a film on the substrate is treated with an aqueous solution of a metal salt from main group I in the periodic table of the elements, a complexing agent and/or a basic compound having a pH value > 10.