UV LACQUER FOR DIRECT TO METAL APPLICATION

The present invention relates to UV-curable lacquer compositions that are in particular suitable for use on plasma-treated substrates like tin-free steel, tin-plated steel or aluminum. These substrates can be used as industrial, food or beverage packaging materials.

For many years, metal packaging materials have been coated using heat-curable coating compositions. Such coatings contain volatile organic solvents and consume quite a lot of energy. To lower or even eliminate the amount of such organic solvents and to lower the energy consumption needed for the full cure of the coating, Applicant has developed various types of UV-curable coating systems. By using these UV-curable coatings, the amount of solvent released during curing can be reduced by more than 40% in comparison to the heat-curable systems. Since UV-curing is a fast process (full cure in less than 20 seconds), the use of UV-curable coatings leads to a faster production process at lower costs.

It was found that using these UV-curable lacquers on tinplate or tin free steel showed some non-consistent performance, partly due to the adhesion performance of these coatings. It is known in the art that the above-mentioned substrates need to be treated before a protective coating can be applied, since the surface of these substrates is often contaminated. This contamination reduces the adhesion of a lacquer that is applied to such surface.

It was found that by using a plasma pretreatment, the surface of such substrates shows an improved adhesion of a lacquer that is applied, in comparison to the untreated surface. However, it was noted that with the available UV-curable lacquers, still defects were observed leading to poor adhesion, which makes these coated substrates less suitable for use as packaging material for industrial, food or beverages.

The present disclosure provides a UV-lacquer composition that shows a superior adhesion to the substrates that are typically used as food or beverages packaging material, such as tin-free steel, tin-plated steel or aluminum.

In one aspect, the present disclosure relates to UV-curable lacquer composition comprising

a) A mixture of different epoxy resins,
b) An acrylate compound,
c) A photoinitiator,
d) Polycaprolactone triol, and

e) Cellulose acetate butyrate.

Tin free steel (TFS) is widely used as packaging material for food and beverages, for example as a food container. TFS consists of a thin layer of chromium and a layer of chromium oxide deposited on a steel base. This material has a metallic luster and good corrosion resistance.

Tinplate or tin plated steel consists of a thin layer of tin-iron alloy, a layer of tin, a layer of tin oxide and a passivation layer deposited on a steel base. This material has a good corrosion resistance, a good formability, and is easy to weld.

In another aspect, the present disclosure relates to a process for applying a coating to a metal substrate, comprising the following steps

i. Prior to application of a coating composition a plasma treatment of the surface of the substrate is performed,

ii. Following the plasma treatment, a coating composition is applied to the plasma-treated surface of the substrate, and

iii. Curing of the coating composition by exposing the substrate obtained in step ii) to UV radiation,

wherein the coating composition that is applied in step ii) is the UV-curable lacquer composition as defined herein.

Coating composition

The coating composition according to the present invention comprises the following ingredients:

Epoxy resin

The composition according to the present invention comprises a mixture of different epoxy resins. In one embodiment, this mixture comprises an aliphatic epoxy resin and an aromatic epoxy resin. In a further embodiment, the mixture of different epoxy resins comprises at least 85 wt.% of one or more aliphatic epoxy resins, the wt.% being calculated based on the total weight of epoxy resins present in the lacquer composition.

Suitable aliphatic epoxy resins that can be used in the composition according to the present invention include epoxy resins, which are customary in epoxy resin technology. Examples of such epoxy resins include the following:

I) Polyglycidyl ethers or poly-(p-methylglycidyl) ethers, obtainable by reacting a compound having at least one, preferably two, free alcoholic hydroxyl groups with epichlorohydrin or β-methylepichlorohydrin under alkaline conditions or in the presence of an acidic catalyst with subsequent alkali treatment. The glycidyl ethers of this type are derived for example from acyclic alcohols, such as ethylene glycol, diethylene glycol or higher poly(oxyethylene) glycols, propane-1,2-diol or poly(oxypropylene) glycols, propane-1,3-diol, butane-1,4-diol, poly(oxytetramethylene) glycols, pentane-1,5-diol, hexane-1,6-diol, hexane-2,4,6-triol, glycerol, C12-14OH (Araldit® DY- E) 1,1,1-trimethylolpropane, pentaerythritol, sorbitol, and also from polyepichlorohydrins. Other glycidyl ethers of this type are derived from cycloaliphatic alcohols, such as 1,4-cyclohexanedimethanol, bis(4-