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(54) Title: CHANGING SURFACE PROPERTIES BY FUNCTIONALIZED NANOPARTICLES

(57) Abstract: A process for modifying the surface of an inorganic or organic substrate with strongly adherent nanoparticles is described, providing to the surface modified substrate durable effects like hydrophobicity, hydrophilicity, electrical conductivity, magnetic properties, flame retardance, color, adhesion, roughness, scratch resistance, UV-absorbance, antimicrobial properties, antifouling properties, antiprotein properties, antistatic properties, antifog properties, release properties. In this process, an optional first step a) a low-temperature plasma, ozonization, high energy irradiation, corona discharge or a flame is caused to act on the inorganic or organic substrate, and in a second step b) one or more defined nanoparticles or mixtures of defined nanoparticles with monomers, containing at least one ethylenically unsaturated group, or solutions, suspensions or emulsions of the afore-mentioned substances, are applied, preferably at normal pressure, to the inorganic or organic substrate. In a third step c) suitable methods are applied to dry or cure those afore-mentioned substances and, optionally, in a fourth step d) a further coating is applied on the substrate so pretreated.

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AMENDED CLAIMS

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1. A process for modifying the surface of an inorganic or organic substrate with strongly adherent nanoparticles, which process is characterized in that nanoparticles containing at least one polymerizable group chemically bonded to their surface, or mixtures of such nanoparticles with monomers or/and oligomers, or a solution, suspension or emulsion containing said nanoparticles, are applied to the surface previously treated with plasma, corona discharge, ozonization, high energy radiation or flame treatment, without addition of a photoinitiator, and the surface thus pretreated is radiation dried using suitable methods.
2. Process of claim 1, wherein the polymerizable group is an ethylenically unsaturated group, and the radiation applied in the drying step is from the ultraviolet and/or visible range.
3. A process according to claim 1 for modifying the surface of an inorganic or organic substrate with strongly adherent nanoparticles, wherein the inorganic or organic substrate is subjected to the following steps
- a) a low-temperature plasma treatment, a corona discharge treatment, an ozonization, an ultra-violet irradiation and/or a flame treatment is carried out on the surface,
 - b) application of nanoparticles containing at least one ethylenically unsaturated group chemically bonded, or mixtures of such nanoparticles with monomers or/and oligomers, or a solution, suspension or emulsion containing said nanoparticles, without addition of a photoinitiator, to the surface, and
 - c) drying with light from the ultraviolet and/or visible range, especially from the range 200-700 nm.
4. Process of claim 3, wherein step b is carried out directly after step a, and/or step c is carried out directly after step b.
5. Process according to any of claims 1-4, wherein the nanoparticles applied in step b) comprise a nanoparticle of the formula I₁