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Synthesis of Thick Photocatalytic Titania Surface Layers by Solution Plasma Spraying and Subsequent Treatment by Pulsed Laminar Plasma Jet

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Abstract

The two-stage method of synthesis of TiO₂ photocatalytic surface layers with improved adhesion and cohesion, and photocatalytic properties based on vortex atmosphere solution precursor plasma spraying (SPPS) of thick anatase-rutile mixed coatings and their subsequent melting by pulsed laminar argon-helium plasma jet followed by auto-quenching and solidification is offered and approved for the first time. The titania coatings with increased rutile/anatase ratio characterized by high degree of crystallinity, increased specific surface area and permeability, and also advanced cohesion and bond strength with metal substrate, are sufficiently obtained for practice. The properties of the coatings were studied using X-ray diffraction (XRD) analysis, scanning electron and optical microscopy, BET- assisted measuring specific surface area and methylene-blue (MB) decoloration testing in an ultra-violet (UV) light room. Since the experimental determination of conditions of the post-treatment of the as-sprayed coatings by pulse plasma jet is rather labor- and power-consuming procedure, preliminary computer-aided evaluation has been carried out.

Key words: photocatalysis, titania, coating, plasma, spraying, post-treatment

Nomenclature

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