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## Powerful Pulse Discharge Oxidation as a Novel Method of Thin Oxide Film Preparation

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Anodization of metals is widely used in technology. Two main anodization methods are generally applied: conventional (galvanostatic or potentiostatic) and plasma electrolytic oxidation (PEO). Recently a new method – powerful pulsed discharge oxidation (PPDO) has recently been developed. In PPDO, the reaction proceeds at the metal-electrolyte interface on applying a high voltage pulse (up to 2 kilovolts). The characteristic features of the films prepared by PPDO are fast growth and homogeneity. This results in formation of the oxide films with properties significantly different than those obtained by conventional approaches. The oxide films prepared by pulsed discharge method in different acid electrolytes are constituted by a single uniform dense amorphous layer, while films with the same thickness prepared by the conventional galvanostatic method in the same electrolyte reveals more complex structure consisting of two layers: an inner crystalline one and an outer amorphous layer.

In current work we will present a thin films prepared by PPDO method and make comparison with those prepared by conventional galvanostatic method. Films prepared on titanium and aluminium in different solutions (phosphoric, sulfuric acids, ammonium pentaborate) as well as those prepared in distilled water will be discussed. A significant difference of donor concentration in the PPDO titania films was observed. EIS and photocurrent studies also demonstrate important difference between films prepared by different methods.

Also the discharge method can be used for preparation of nanocontainers inside the films. While conventional methods usually destroy porous anodic films on titanium and aluminium, it was found that in process of PPDO plasma which appears on the film surface can melt the top layer of the pores, which brings to the pore sealing. These results can open wide perspectives for preparation of self-healing coatings.

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