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Plasma electrolytic oxide layers as promising systems for catalysis

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Abstract

The paper overviews the various approaches for obtaining the metal-supported PEO layers with a developed surface. They are following: (1) pre-etching the metal surfaces, (2) using the electrolytes in which linear discharges are realized under certain conditions of PEO processing, (3) the use of oxide-forming electrolytes for obtaining ornamental structures, (4) applying the electrolytes with isopoly and heteropoly anions in which islet growth of coral-like structures is possible. It is shown that changing the composition and pH of the electrolyte, the electrical parameters of PEO processing you can control the sizes of surface relief fragments such as pores, micro- and nanostructures and create conditions for the formation of developed surface and secondary layers. Using PEO structures as a substrate for subsequent deposition of the catalytically active components by methods of impregnation, extraction, and sol-gel synthesis allows one to form the developed surfaces with nanowires, nanospheres, hedgehog-like structures too. Application of the discussed methods may improve the efficiency of catalysts formed using PEO technology.

Keywords

Plasma electrolytic oxidation
Surface morphology
Nanostructures

1. Introduction

Plasma Electrolytic Oxidation (PEO), which is electrochemical method of surface treatment of valve metals under electric discharges, is used for the formation of multicomponent oxide coatings with valuable physical and chemical properties [1-3]. Besides, it is a prospective method for the obtaining of functional coatings [4-15] including those designed to prepare the catalysts [16-29]. Among them, there are catalytically active layers [16-20] and carriers of catalytically active compounds [21-23], photocatalysts [24-26] and electrocatalysts [27-29].

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