Utilization of Kaolin Residue for Plasma-Assisted Electrolytic Oxidation in Aluminum Alloy 5052

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Abstract

Kaolin is a mineral widely exploited in the national and international trade for various industrial purposes especially for bleaching and paper filler. The kaolin processing process generates 500 thousand tons of annual residue. Residue is usually disposed of in hills and can cause environmental damage such as contamination of water and soil, as well as changes in the natural landscape. Aiming at the valorization of the kaolin residue, this work proposes its use in the production of protective coatings in aluminum alloy by the technique of electrolytic oxidation assisted by plasma (PEO) and evaluation of the characteristics of the coatings obtained. PEO is the name given to the technique for treating metal surfaces similar to anodizing, but combined with the atmospheric plasma technique. In this work, coatings on 5052 aluminum alloy substrates were produced by PEO using electrolytic solution of 5 g/L kaolin residue, the time of deposition being varied in 5, 10 and 15 minutes, in order to investigate the Properties of the coatings obtained under these conditions. The coatings were evaluated for their thickness, chemical and mineral composition, wettability, roughness and morphology. In this way a rough and hydrophilic coating was produced, whose morphology is characterized by pores and regions of coalescence. The elemental chemical composition of these coatings shows Al, Si, O and Mg, elements present in the aluminum alloy and in the electrolytic solution. This coating is composed of ceramic material and presents crystalline structure corresponding to alumina. For a longer deposition time (15 minutes) a crystalline structure corresponding to mullite is also formed. These compounds are characterized by good chemical stability, high refractoriness and ability to withstand high temperatures, allowing their use in the development of new materials technologies.

Keywords: *Kaolin, kaolin residue, electrolytic plasma, ceramic coating.*