

**Ceramic Coatings Formed on Aluminum Alloys
by Plasma Electrolytic Oxide Process**

Kai Wang, Bon-Heun Koob, Chan-G u Leec, Young-Joo Kimd, Uk-Rae Choe
School of Nano & Adyanced Materials Engineering, Changwon National Uniyersit , Changwon, Korea
awangkai@changwon.ac.kr, bbhkoo@changwon.ac.kr, cchglee@changwon.ac.kr, ddudwn0486@chongwon.ac.kr,
exenes79@changwon.ac.kr

Abstract

Plasma electrolytic oxidation (PEO), or microarc oxidation (MAO), is an electro chemical and physical surface treatment process for generating oxide coatings on metals. It is used to grow thick and large-crystalline ceramic oxide coatings on metals such as aluminum, magnesium and titanium[1]. Because they can present high hardness and continuous barriers, these coatings can offer good protection against abrasion, corrosion and heat as well as electrical insulation. In the present work, 6061 series aluminum alloy is chosen as the matrix material for its high performance amplitude among these metals. As the electrolyte composition, voltage, current, frequency, reaction time are the main parameter of influence with the final coating property [2]. This study try to figure out the electrolyte with best cost-performance. The experimental electrolyte composition includes: 0.5-2 g/L NaOH as the electrolytic conductive agent, 2-30 g/L Na₂SiO₃ as the coating formative agent, 0.5-2 g/L NaCl as a special functional agent [3]. A combined composition and structure analys is of surface and cross section layer was carried out by XRD, OM, SEM/EDS for the specimens PEO-treated at different time intervals with 200DC plus different AC 50Hz power supplies (140V-220V). In addition, micro hardness on the surface and cross section layer were measured to correlate the evolution of microstructure and resulting mechanical properties. In different AC power supplies, the surface morphologies observed by SEM have different appearances, and also the difference of mechanical properties exit. And as the reaction time increases, the ceramic coating thickness and section layer micro hardness also has a corresponding increase. More detailed investigation is required to provide full optimisation of PEO process and a deeper insight into the composition-structure-property relationships for the coatings produced, in oder to acquire the final cost-performance electrolyte composition.

Keywords : Plasma Electrolytic Oxide, Ceramic Oxide Coating, Aluminum Alloy, Electrolyte, Power Supply