
Arcing behavior during plasma electrolytic oxidation of light metals

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Anodic oxide films can be formed on light metals, such as Mg, Al and Ti alloys, by plasma electrolytic oxidation (PEO) process in liquid solutions containing various anions, such as OH⁻, PO₄³⁻, SiO₃²⁻, CO₃²⁻, F⁻ and AlO₂⁻. PEO process includes always the generation of light and heat by arcings. Small and large arcing sound can be accompanied with the generation of light. Some arcs are generated uniformly over the whole surface, which is called as uniform arcing, and some arcs occur only at a specific site, which is called as group arcing. Some arcs are randomly generated, not depending on the position of previous arcs, called as random discharge, and some others are generated at the neighboring site of the previous arcs which result in the movement of arcs as a form of line and it is called as line discharges or moving arcs. In general, uniform and random arcings result in thin and smoother PEO films while group arcings form thick and porous PEO films. PEO films can be grown vertically or laterally, depending on the solution composition, form of applied current and PEO treatment time. In this presentation, PEO film formation behavior on Al and Mg alloys will be discussed on the basis of arcing behavior under the application of DC and pulse current in aqueous solutions.