

Anodization behaviour of friction stir processed aluminium surface composites

Rajashekhara Shabadi*¹, Visweswara Gudla², Ambat Rajan³, Flemming Jensen⁴, Aude Simar⁵

1: Université Lille 1- Sciences et Technologies, UFR de Chimie, France

2: Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark, Department of Mechanical Engineering, Denmark

3: Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark, Department of Mechanical Engineering, Denmark

4: Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark, Department of Mechanical Engineering, Denmark

5: Université Catholique de Louvain - iMMC, Place Sainte Barbe 2, 1348 Louvain-la-Neuve, Belgium, Department of Mechanical Engineering, Belgium

Multiple-pass friction stir processing (FSP) was employed to impregnate TiO₂ (rutile) powders into the surface of an Aluminium alloy. The surface composites of Al-TiO₂ were then anodized in a sulphuric acid electrolyte. The effect of anodizing parameters on the resulting optical appearance was studied. Microstructural and morphological characterization was performed using scanning (SEM) and transmission electron microscopy (TEM), and X-ray diffraction (XRD). The surface appearance was analysed using an integrating sphere-spectrometer setup which measures the diffuse and total reflectance of light from the surface. Compared to samples without TiO₂, surface appearance after anodizing of samples with TiO₂ changed from dark to greyish white upon increasing the anodizing voltage. This is attributed to the localized microstructural and morphological differences around the TiO₂ particles incorporated into the anodic alumina matrix. The TiO₂ particles in the FSP zone were partially or completely amorphized during the anodizing process, and also electrochemically shadowed the anodizing of underlying Al matrix.