Corrosion and anodizing behavior of dissimilar AA5052-H32 and AA6061-T6 alloys joined by metal inert gas welding

Rafael Emil Klumpp[ab], Isolda Costa[a] , Marie-Georges Olivier [b]

[a]*Instituto de Pesquisas Energéticas e Nucleares, Av. Prof. Lineu Prestes, 2242, São Paulo,Brazil.*

[b] *Université de MONS, Materials Science Department, Rue de l´Epargne 56, 7000 Mons, Belgium*

Abstract

Enormous efforts have been made to reduce fossil fuel consumption and greenhouse gas emissions in several sectors, such as the transport and agricultural sectors. Weight reduction is an efficient way to reduce fuel consumption. In this context, Aluminum alloys are excellent choices due to their properties of lightweight and high strength. However, corrosion is a major concern when using dissimilar alloys joined by welding. This might result in galvanic corrosion. Also, thermal effects during welding might affect the microstructure and the material corrosion resistance. Consequently, the study of dissimilar materials joined by welding is of great importance. In order to decrease corrosion susceptibility, surface protection of aluminum alloys against corrosion is a core issue in these applications. In this work, the corrosion resistance of the AA5052-H32 and AA6061-T6 alloys welded by metal inert gas (MIG) welding, with or without TSA anodizing, was investigated. The corrosion resistance was evaluated by immersion tests in sodium chloride solution and monitored by electrochemical impedance spectroscopy (EIS) and as scanning vibrating electrode technique (SVET). The anodic layers formed by TSA anodizing were analyzed and characterized by Scanning Electron Microscopy with Energy-Dispersive Spectroscopy (SEM-EDS) and Transmission Electron Microscopy (TEM). The results present the correlation between corrosion resistance, microstructure and surface film characteristics.

Key–words: Anodizing, Corrosion, Dissimilar welded alloys, AA5052-H32 and AA6061-T6 alloy.