

Corrosion Analysis and Interfacial Characterization of Al - Steel Metal Inert Gas Weld - Braze Dissimilar Joints by Micro Area X-Ray Diffraction Technique

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Abstract : Automotive light weighting is of major prominence in the current times due to its contribution in improved fuel economy and reduced environmental pollution. Various arc welding technologies are being employed in the production of automobile components with reduced weight. The present study is of practical importance since it involves preferential substitution of Zinc coated mild steel with a light weight alloy such as 6061 Aluminium by means of Gas Metal Arc Welding (GMAW) – Brazing technique at different processing parameters. However, the fabricated joints have shown the generation of Al – Fe layer at the interfacial regions which was confirmed by the Scanning Electron Microscope and Energy Dispersion Spectroscopy. These Al-Fe compounds not only affect the mechanical strength, but also predominantly deteriorate the corrosion resistance of the joints. Hence, it is essential to understand the phases formed in this layer and their crystal structure. Micro area X - ray diffraction technique has been exclusively used for this study. Moreover, the crevice corrosion analysis at the joint interfaces was done by exposing the joints to 5 wt.% FeCl₃ solution at regular time intervals as per ASTM G 48-03. The joints have shown a decreased crevice corrosion resistance with increased heat intensity. Inner surfaces of welds have shown severe oxide cracking and a remarkable weight loss when exposed to concentrated FeCl₃. The weight loss was enhanced with decreased filler wire feed rate and increased heat intensity.

Keywords : automobiles, welding, corrosion, lap joints, Micro XRD

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