

Adhesive bonding of aluminium with structural acrylic adhesives: durability in wet environments

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Abstract— The durability of EN AW 6082-T651 aluminium alloy joints bonded with a toughened acrylic adhesive was investigated upon exposure to wet environments (humidity, water immersion and salt water immersion). Environmentally-friendly surface treatments were used to avoid hexavalent chromium. Single lap shear tests were used to determine the durability of the adhesively bonded joints. Specimens were exposed to 31% and 95% relative humidity and submerged in deionized water and 3 wt% sodium chloride solution at 25°C and 50°C, for 10, 30 and 90 days. The data collected in the experiments showed that the durability was higher for surfaces treated with γ -methacryloxypropyltrimethoxysilane (γ -MPS) and sulfo-ferric etchant (P2 etch) than other surface treatments. Both these treatments improved considerably the durability in all environments tested. The results indicate that specimens even without surface treatment maintained a significant residual strength after exposure to low humidity environment (room temperature at 31% RH). The joints exposed to a high humidity environment showed a higher reduction in adhesive strength than those immersed in deionized water and saline solution.

Index Terms— Acrylic adhesives; water effects; aluminium joints; surface treatment; silane; p2 etch;

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