

Effects of Substrate Surface Roughness and Adhesive Elongation on the Adhesion Strength of Metal–Composite Joints

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Materials, Adhesive, Joining, Stainless steel, Aluminum alloy, Composite material, GFRP [D3]

In this study, the effects of adhesive type, elongation, and adherend surface roughness on the bonding strength between metallic and composite materials were investigated. The results showed that a urethane-based adhesive provided higher bonding strength than an acrylic-based adhesive, and that increasing elongation improved the bonding performance, with the 20% elongation adhesive exhibiting the highest strength. All specimens failed at the metal/adhesive interface, indicating that interfacial properties strongly influence bonding strength. For SUS316, increasing surface roughness enhanced bonding strength due to increased surface area and anchoring effects. In contrast, for A5052H, bonding strength decreased with increasing roughness, which is attributed to insufficient wettability and poor adhesive penetration into surface asperities. These findings demonstrate that interfacial characteristics, particularly wettability, play a critical role in determining bonding performance.

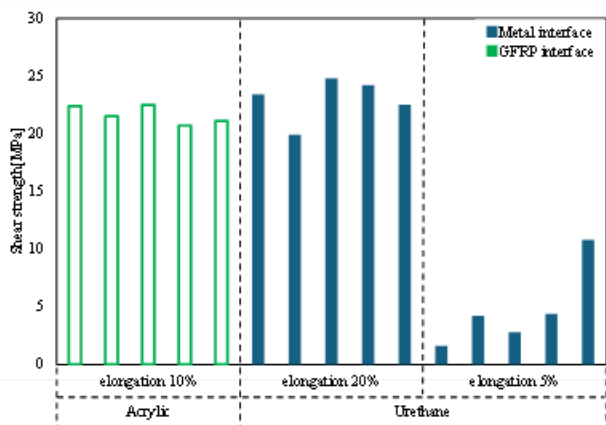


Fig.1 Shear tensile test results (Adhesive comparison)

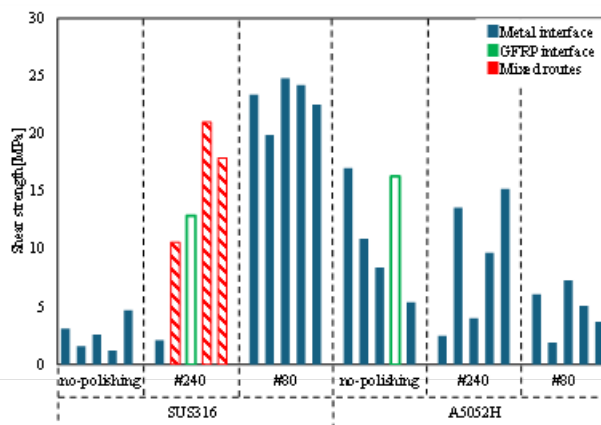


Fig.3 Shear tensile test results (Metal comparison)

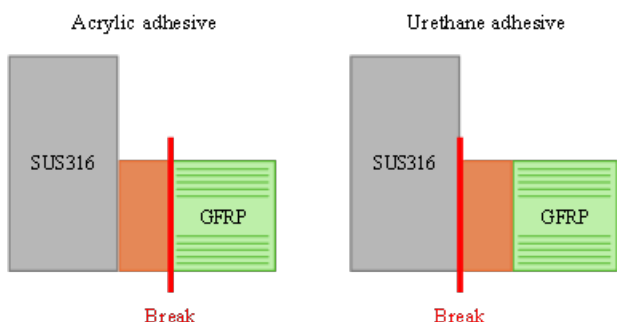


Fig.2 Broken route (Adhesive comparison)

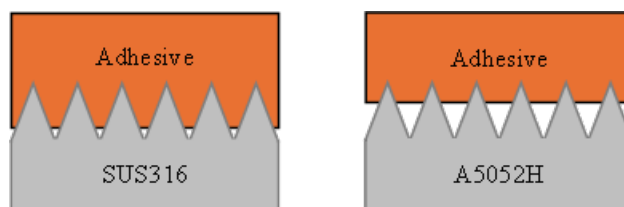


Fig.4 Anchor effect