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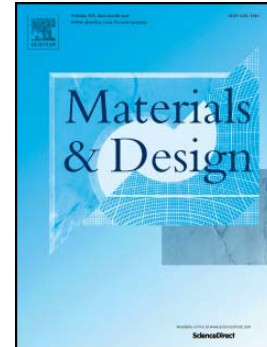
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Mechanical behaviour of polymer-metal hybrid joints produced by clinching using different tools

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Abstract

In the present study, the mechanical behaviour of polymer-metal hybrid connections produced by clinching is investigated. Thin sheets were joined using different tools including grooved, split and flat dies as well as rectangular tools. The effect of the joining force on joinability was also analysed. Polycarbonate was used as the polymer partner since its high strength and toughness, while aluminium alloy AA6082-T6, which is characterized by a high yield stress but low ductility, was used as the metal sheet. Mechanical characterization involved single lap shear tests and peeling tests. According to the achieved results, grooved dies are not suitable for joining polymers. Rectangular clinching tools required lower joining forces and produced the highest peeling performances; however, because of the low ductility of the aluminium alloy, the joints were partially damaged resulting in weakest shear strength. Round clinching tools required higher joining force as compared to rectangular ones. The joints produced by flat dies were characterized by higher shear strength; however, because the small interlock produced, they were characterized by small values of peeling strength. Round split dies allowed producing the joints with highest performances in shear and peeling tests.

Keywords: thermoplastic; aluminium alloy; joining; thin sheet; mechanical characterization; strength

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