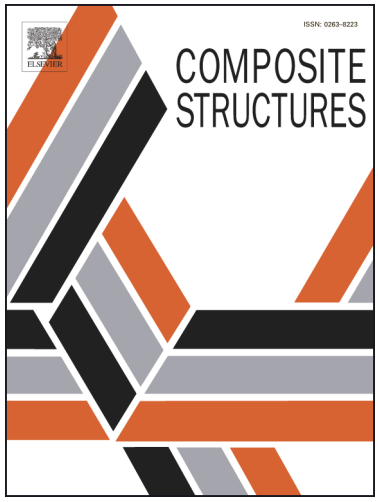

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Mechanical behavior of AA5053/polyetheretherketone (PEEK) made by Friction Assisted Joining

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Abstract

The mechanical behavior of polymer-metal structure (PMCS) made by Friction Assisted Joining is investigated. Al-Mg Alloy and polyetheretherketone (PEEK) were adopted. Laser texturing was performed on the aluminum substrate to enhance the strength of the joints. A campaign of experimental tests was conducted by varying the energy supplied during the joining process. During the heating and the cooling phases, the thermal history and temperature gradients were monitored by means of an IR camera. Single lap shear tests were conducted to determine the mechanical behavior of the joints. Morphological analysis and fracture surface analysis were performed by means of Optical Microscopy and Scanning Electron Microscopy to evaluate the material flow produced under different processing conditions as well as the mean features of the joints. The highest strength joints were achieved after a heating time of 25 s to which corresponded an supplied energy of 3.5 kJ, which led to a maximum and average temperature (reached by the upper aluminum surface during the joining process) of 390 °C and 350 °C, respectively. Under such conditions, the maximum shear force of 6.9 kN and an average shear strength of 47 MPa were achieved corresponding to a joint efficiency of 83%.

Keywords Friction Assisted joining; direct-joining; joining; Thermal analysis; Energy analysis; PMCS;

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