

Influence of tool shoulder geometry on mechanical properties and roughness of FSW joints

Influența geometriei umărului sculei asupra proprietăților mecanice și rugozității îmbinărilor realizate prin procedeul FSW

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Abstract

The properties of FSW welds depend on a number of parameters, most notably: tool geometry and rotational speed, as well as welding speed. In this paper, two tools geometries were tested, with and without cavity in the shoulder and both with square pin. Mechanical properties and surface roughness of the AA5052 alloy was tested. It was found that for obtaining a tunnel defect free weld which also influences mechanical properties and roughness, a careful optimization of the welding parameters is needed. It was found that the highest mechanical properties were obtained with the tool with cavity in the shoulder and at the lowest welding speed. The obtained tensile properties were higher than those of the base material, with 105 % weld efficiency calculated by ultimate tensile strength and 120 % calculated by proof strength. Furthermore, the tool with the cavity in the shoulder provided significantly lower average surface roughness and maximum roughness than those obtained with the tool without cavity in the shoulder. Such weld properties were obtained probably due to a more efficient material flow during FSW process, as well as due to a lower material adhesion to the tool.

Keywords

FSW, mechanical properties, roughness