

Tensile behavior of Friction Stir Welded Al 6061 with incorporated CuO nanoparticles.

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FSW of Aluminium alloys have increasingly become common in the current times. In order to increase the strength and hardness, various parameters from micro to nano are incorporated in the weld joint by drilling holes or by grooves at the joint.

In the present study CuO nanoparticles prepared by using novel Sol-gel method of size 40-200nm were incorporated in the joint. The particles were placed by drilling method with a drill bit of 2mm in Al 6061 plate of thickness 6mm. The welding parameters employed were feed speed 45mm/min, RPM 900, with a maximum load of 25Mpa using H13 steel tool of cylindrical shape. Tensile samples were prepared by using EDM in the direction perpendicular to the joint and were tested in UTM. For comparison, the plates without welding and also the plate without powder were also tested under identical conditions. It was observed that the strength of welded FSW joint of Al 6061 is nearly 55% of the strength of the parent plate. However with the incorporation of CuO nanoparticles, strength and hardness are improved by about 10-15% over the pure FSW joint. The mechanical properties are correlated with the microstructure of the weld interface and the fractography of the tensile tested samples.

Keywords: Metaloxide Nanoparticles; Friction Stir Welding; Metallurgical Properties; Al 6061; CuO Nanoparticles