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The Effect of Friction Stir Vibration Welding Process on Characteristics of SiO₂ Incorporated Joint

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Abstract: Different methods have been applied to improve the mechanical properties of joint manufactured by friction stir welding (FSW). One is addition of second phase particles into the stir zone to reinforce the joint and to constitute a particle reinforced metal matrix composite. The problem with regard to this method is non-homogenous distribution of particles during FSW. In the current research, friction stir vibration welding (FSVW) process is applied for welding. The joining workpieces of Al5052 alloy are vibrated normal to the weld line during FSW while SiO₂ particles are incorporated into the weld. Microstructure and mechanical properties of welds are compared with those made by conventional FSW. Vibration decreases the grain size in the weld region and increases the homogeneity of particles distribution. Strength, hardness and ductility of FSV welded specimens are higher than FS welded specimens. Application of FSVW as an “easy to apply” friction stir welding method to improve the mechanical properties of joint included second phase particles is recommended.

Keywords: “Friction stir vibration welding”, “SiO₂ nanoparticles”, “Microstructure”.