

Effects of Different Particulate Reinforcements on the Hardness, Impact and Tensile Strengths of Aa6061-T6 Weldments Obtained by Friction Stir Welding

Taiwo Ebenezer Abioye^{1*}, Hussain Zuhailawati², Abu Semen Anasyida², Sesan Peter Ayodeji¹ and Peter Kayode Oke¹

¹Federal University of Technology, Nigeria

²Universiti Sains Malaysia, Malaysia

Due to loss of structural strengthening at temperatures beyond 250 °C, heat treated aluminium alloys (e.g. AA 6061-T6) weldments are usually characterised with poor mechanical properties including hardness, tensile and impact strengths. In this work, friction stir weldments reinforced with the addition of SiC, B₄C and Al₂O₃ particles at the joints were produced and investigated for improved hardness, tensile and impact strengths over the unreinforced weldment. The microstructure of the weldments was also examined using both optical and scanning electron microscopies. The entire reinforced welded joint exhibited improved hardness because of the enhanced metal matrix grain refinement and inherent high hardness of the reinforcement particles. B₄C particle with the highest hardness produced hardest joint of about 81% of the base metal hardness (~114 HV0.3). Also, the impact energies of the SiC (16.9 J) and Al₂O₃ (12.2 J) reinforced weldments are closer to that of the base metal (18.6 J) compared with the unreinforced weldment (9.6 J). The reinforced weldments showed no improvement over the tensile strength of the unreinforced weldment. B₄C and SiC reinforcement produced the highest improvements in the hardness (at the joint) and impact strength of the AA 6061-T6 friction stir weldments respectively.

Keywords: Friction Stir Welding; AA 6061-T6; Particles reinforcements; Tensile strength; Impact strength; Hardness.

Biography

Taiwo E. Abioye completed his PhD from University of Nottingham, UK and undergone his post-doctoral study at Universiti Sains Malaysia, Penang, Malaysia. He is currently a Senior Lecturer in the Department of Industrial and Production Engineering, Federal University of Technology Akure, Nigeria. His research areas include laser materials processing, welding/joining technologies, additive manufacturing, materials characterisation and testing. He has published more than 30 papers in reputed journals and has been a regular reviewer to many reputed journals.