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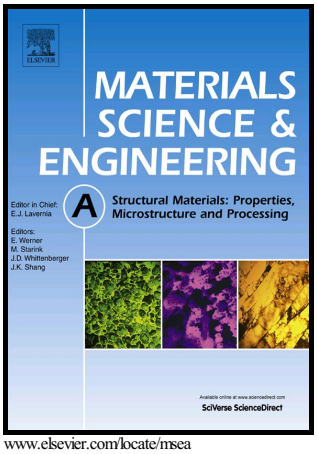

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Investigations on Microstructure and Mechanical properties of TiO_2 Nanoparticles addition in Al 3003 alloy joints by Gas Tungsten Arc Welding

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Abstract

Al 3003 alloy is well known for its industrial use as heat exchangers, radiators, oil tanks and household utensils. In case of heat exchangers, fabrication becomes mandatory by a welding process which is carried out by Gas tungsten arc welding (GTAW). It is preferred due to its advantages of superior mechanical properties. Thus by involving GTAW process and reinforcing with suitable nanoparticles, the strength of Al 3003 alloy can be improved at the joints. Hence this technical paper deals with the fabrication of Al_{100-x} – x wt.% TiO_2 (x=0,0.75, 1.5,2.25 and 3) nanocomposite filler metal through accumulative roll bonding (ARB) technique to weld Al 3003 alloy through GTAW. Further characterisation studies have been made through various electron microscopic techniques besides X-ray diffraction analysis (XRD), vicker's microhardness and tensile testing. It was observed that the incorporation of TiO_2 nanoparticles reduced the grain size much due to the formation of more nucleation sites and deceleration growth. XRD results revealed the presence of TiO_2 peaks in the composite. FESEM confirmed the distribution of second phase nanoparticles regularly in the Al matrix. TEM analysis showed that the nanoscale TiO_2 distribution and strain fields due to thermal mismatch between matrix and reinforcement. The improvement in mechanical

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