

Characterization of Al-0.12Zr-0.15Ce Reinforced by Al₂O₃np as Composites Conductor

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Abstrak

Aluminum, as a conductor material, has long been used for high-voltage overhead transmission lines due to its economic value and high electrical conductivity. By adding Al₂O₃np and alloying elements such as zirconium (Zr), cerium (Ce), and magnesium (Mg), aluminum's strength and performance could be improved without compromising too much of its electrical conductivity. The focus of this research was to investigate the mechanical, electrical properties, and microstructure of Al-0.12%Zr-0.15%Ce-5%Mg, reinforced with different volume fractions (from 0.5 to 1.5%) of Al₂O₃ nano particles, using the stir casting method. The tensile strength of the composite was improved by up to 1.2 vf-% in alumina, and decreased with further addition due to clustering and pores, while elongation was reduced with when increasing the reinforcement. It was found that the electrical conductivity of the composite generally decreased with the addition of reinforcement. The microstructure observations showed that the composites yielded finer grains and more pores than the unreinforced alloy, with 1.2vf-% of reinforcement having the finest grain. The electrical conductivity of the composite was 44% IACS, which is still lower than that of the unreinforced alloy.