

The effects of Al₂O₃ amount on the microstructure and properties of Fe-Cr matrix composites

Abstract

Iron based matrix composites reinforced with 5 to 25 wt pct of Al₂O₃ particles were fabricated using the powder metallurgy method. The samples were prepared by mixing at 250 rpm for 30 minutes, uniaxially pressing at 750 MPa and sintering in a vacuum furnace at a temperature of 1373 K (1100 °C) for 2 hours with 10 °C/min heating rate. The optimum amount of reinforcement was determined by evaluating the microstructure, relative density, total porosity, micro Vickers hardness, and wear resistance of the composites. The results and analysis revealed that the micro Vickers hardness and wear resistance of the composites were better after increasing the reinforcement up to 20 wt pct. Increasing the Al₂O₃ particles to 25 wt pct resulted in a decrease in mechanical properties due to agglomeration of the particles in the matrix, which lowers the interaction between the matrix and reinforcement.