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Investigation of Wear Properties of Aluminum Matrix Composites Reinforced with Silica Nano-particles Fabricated by the Stir Casting

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Abstract: In this paper, the effect of silica nano-particles as aluminium matrix composite reinforcing agent on microstructural changes and wear properties have been investigated. This composite was fabricated by the stir casting method and the casting temperature was considered as a variable parameter. The scanning electron microscopy (SEM), the optical microscopy (OM), the energy dispersive spectroscopy (EDS), the Vickers hardness test and the pin on disk wear testing were used to study the microstructure evaluation and mechanical properties of various samples. Results showed that the hardness of aluminium matrix increased about 37% by adding 1 weight percent of silica nano-particles. This increase in the hardness value changed by increasing the casting temperature from 750 to 850 °C. Addition of these nano-particles into the aluminium matrix also caused to increase the wear resistance. The highest coefficient of friction value related to the composite with the casting temperature of 800 °C. The wear mechanism was also affected since nano-particles were added to the aluminium matrix. When the casting temperature changed from 750 to 850 °C, the AlNi phase coarsening was also occurred which affected wear properties of the composite.

Keywords: Aluminium Matrix Composite; Silica Nano-particles; Stir casting; Hardness; Wear.