

Developments of Al-12Si Alloys by Reinforcing TiC and TiN Particles.

Abstract

This study presents the mechanical properties of the Al-12Si matrix composite reinforced by various amounts of titanium carbide (TiC) and titanium nitride (TiN) particles. The wear behavior was investigated using a pin-on-disk wear testing machine with varying parameters such as normal load, reinforcement percentage, and track velocity. The results show that the wear of the Al-12Si matrix reinforced by 5, 10, and 15% TiC particles at 150 rpm with 15-N loads was 73×10^{-3} , 61×10^{-3} , and 50.5×10^{-3} mm³, respectively, which is less than the wear for the same composites at 225 rpm with a 15-N load. This is because of the length of rubbing is more in the case of a higher speed. The results also show that the wear of the samples was decreased with an increasing percentage of reinforcement of TiN at both sliding speeds (150 and 225 rpm). The hardness of the Al-12Si/TiC composites with 5% TiC particles was found to be 50, and the hardness of same composites with 15% TiC reinforcements was 67, which is less than the hardness of Al-12Si/TiN composites with 15% TiN reinforcements. The composites before the wear test showed a uniform distribution of TiC and TiN particles through the cross section of the specimens and finer surfaces compared with matrix composite after the wear test. The mechanical properties such as hardness and wear resistance are observed to be increased considerably compared with the matrix composite.

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