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A Comparative Study of Microstructure, Thermal and Mechanical Properties of A359 Composites Reinforced with SiC, Si3N4 and AlN Particles

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Abstract : A comparative study of the thermal and mechanical behavior of squeezed A359 composites containing 5, 10 and 15 wt.% SiC, (SiC+ Si3N4) and AlN particulates was investigated. Stir followed by squeeze casting techniques are used to produce A359 composites. It was noticed that, A359/AlN composites have high thermal conductivity as compared to A359 alloy and even to A359/SiC or A359/(SiC+Si3N4) composites. Microstructures of the composites have shown homogeneous and even distribution of reinforcements within the matrix. Interfacial reactions between particles and matrix were investigated using X-ray diffraction and energy dispersive X-ray analysis. The presence of particles led not only to increase peak hardness of the composites but also to accelerate the aging kinetics. As compared with A359 matrix alloy, compression test of the composites has exhibited a significant increase in the yield and the ultimate compressive strengths with a relative reduction in the failure strain. Those light weight composites have a high potential to be used for automotive and aerospace applications.

Keywords : metal-matrix composite, squeeze, microstructure, thermal conductivity, compressive properties
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