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# **Thermal Stability, Grain Growth Kinetics and Mechanical Properties of Bulk Ultrafine Grained AA6063/SiC Composites with Varying Reinforcement Size**

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## **ABSTRACT**

AA6063/SiC composites with varying reinforcement sizes (12  $\mu\text{m}$  (coarse), 1  $\mu\text{m}$  (fine), 45 nm (nano)) have been developed by a hybrid route of stir-casting and cryorolling. In the present work, the influence of annealing temperatures (423 K to 573 K) on the precipitation evolution, particle stimulated nucleation (PSN), recrystallization, grain growth kinetics and thermal stability of developed bulk UFG composites has been studied. The microstructural evolution is correlated with mechanical behavior. The UFG composites have shown evidence of recrystallized grain structure up to 473 K and 523 K, respectively. Subsequent grain growth of UFG microstructure up to 573 K was observed in the UFG nanocomposite due to the effective pinning of nano SiC particles and precipitates along grain boundaries. This ultimately resulted in increased grain growth activation energy and strength of the UFG nanocomposite. However, the overall increase in strength is maximum in the UFG nanocomposite due to the dominant effect of dislocation strengthening, grain boundary strengthening and precipitation strengthening mechanisms. A thorough examination of the microstructural evolution of UFG composites at different annealing temperatures along with their mechanical behavior is presented in this paper.

**ABSTRACT Content:** 12 point Times New Roman font, Not bold, Justify, Maximum No of words: 500.

**Keywords:** Metal matrix composite, ultrafine-grained material, thermal stability, particle stimulated nucleation.

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