

Engine and Auxiliary Systems

Edited by
Prof. Dr. A.K.M. Mohiuddin



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Production of Aluminium reinforced with SiC particulates using powder metallurgy

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Introduction

The specimen is made by powder of pure aluminum (99.5 wt.%) and silicon carbide (250 μ m). Powder metallurgy is a process in which fine metal powders are compacted into intricate shapes. The process consists of several steps, including powder production, blending, compaction, and sintering. Powders of brittle materials can be produced either by pulverization in a ball mill or by grinding. The reduction process is particularly attractive for ductile materials that are difficult to form into small particles by any other means. Blending the metal powder is necessary to provide a uniform distribution of powder size, for mixing powders of two metals to make an alloy product, or for mixing lubricants that improve flow of powder metals into dies. In the compaction step powders are pressed into shape using hydraulic or mechanically activated presses. The density increases and good particle-to-particle contact is achieved in this step. After going through the compacting stage, the work piece is known as green compact and has the strength for sintering process. Sintering is an important step in powder densification. This is the process by which small particles of a material are bonded together by solid-state diffusion. This thermal treatment results in the transformation of a porous compact into a dense, coherent product. In the sintering process, particles are coalesced by solid-state diffusion at very high temperature but below the melting point of the compound being sintered.

Material Selection

In this study, 99% pure aluminum (Al) powder as matrix and silicon carbide (SiC) powder, particle size of 250 μ m as reinforcement for the composite test specimens. Pure aluminum has a low tensile strength, but when combined with thermo-mechanical processing, aluminum alloys display a marked improvement in mechanical properties, especially when tempered.