

AA6061-Carbon Fibers Composites produced by MM

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Abstract

Aluminum matrix composite materials are commonly used in the industry [1], due to the fact that they are lightweight materials that present good mechanical properties when they are reinforced with different types of non metallic materials. Carbon fibers have been widely used as reinforcement in composite materials for applications in aerospace and automotive industry due to their good properties such as mechanical resistance, tenacity and low density. As reinforcement for aluminum alloys, it has been seen that carbon fibers improve the material hardness and the impact energy [2].

It is known that carbon fibers have low wettability when they are incorporated in molten aluminum, therefore there is no good dispersion of them over the matrix and, hence, mechanical properties are not improved [3]. For this reason the purpose of this investigation was to make use of the mechanical milling (MM) process to disperse carbon fibers into a 6061 aluminum alloy matrix, and to observe the effect of the MM process in both the 6061 matrix and the carbon fibers, as well as the interfaces that may form between components.

Milling times used were 1, 2, 3 and 5 hours. The percentage of carbon fibers was varied from 0.5 to 2.0 wt%. Cold consolidated samples were obtained by using a hydraulic press. Samples were sintered in an argon atmosphere at 773K during 1 to 5 hours.

The microstructural characterization of the as-milled powders, as well as the cold consolidated and later sintered samples, was made by scanning electron microscopy, transmission electron microscopy and X-ray diffraction. Microhardness tests were carried out with the aim of finding the influence of the carbon fibers on the aluminum mechanical properties.

Keywords

Mechanical milling, Al 6061, carbon fibers, microstructure, microhardness.

References

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