Wear Characteristics of AA8090/TiC Metal Matrix Composites

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ABSTRACT

Material property blends and ranges have been, and are yet being, protracted by the development of composite materials as seen from figure 1. This is expressly true for materials that are needed for aerospace, underwater, and transportation applications. Many composite materials are composed of just two phases; one is termed the matrix, which is continuous and surrounds the other phase, often called the reinforcement. For most of these composites, the particulate phase is harder and stiffer than the matrix. These reinforcing particles tend to restrain movement of the matrix phase in the vicinity of each particle [1-4]. In essence, the matrix transfers some of the applied stress to the particles, which bear a fraction of the load. The volume fraction of reinforcement or improvement of mechanical behavior depends on strong bonding at the matrix–particle interface.

The present study accents on estimating the wear rate of AA8090/titanium carbide metal matrix composites. The empirically estimated wear rate values have been compared with the experimental values. Aluminum alloy 8090 was used as matrix material. Titanium carbide (TiC) of 100 nm size was used as a reinforcing material. TiC reinforced AA8090 composites were produced using stir casting technique. In order to characterize the dry-sliding wear behavior of the test specimens, wear tests were carried out on a pin-on-disc machine. Circular pins of diameter 8 mm and height 30 mm were used as test specimens. The wear rate was studied as a function of volume fraction of TiC, applied load, sliding speed and sliding distance.

The analysis on the wear behavior of 8090 Al alloy/TiC composites as the function of vol.% of TiC, normal load, sliding speed and sliding distance using Taguchi's design of experiments was conceded successfully. The wear resistance increases with increase of vol.% TiC nanoparticles in 8090 Al alloy matrix. The optimum wear rate of 0.005581mg/m can be achieved with the volume fraction of TiC should be 20%.

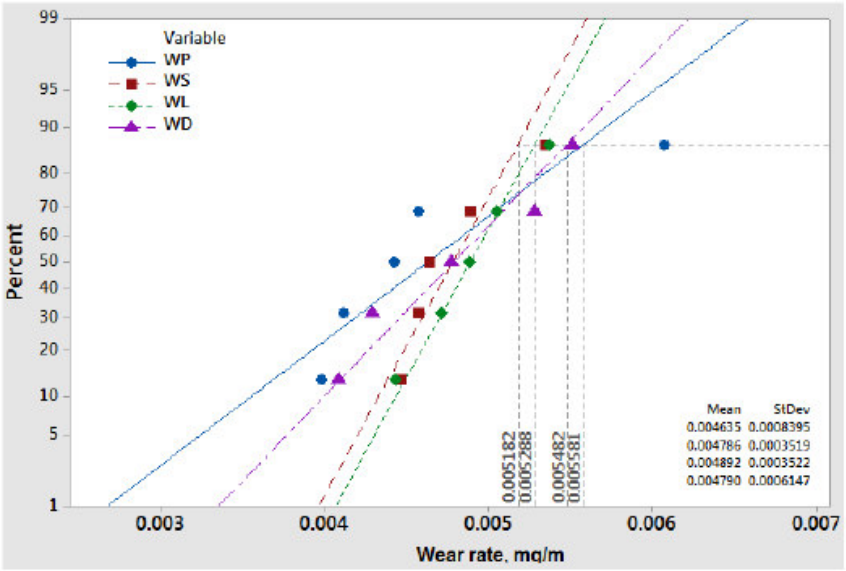

Figure 1: Weight loss functions: (a) reinforcement, (b) applied load, (c) sliding speed and (d) sliding distance.

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