Effect of Wear on Surface Hardness of AA7020 Alloy/SiO_2 Metal Matrix Composites

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ABSTRACT

Particle reinforced materials are more attractive due to their cost-effectiveness, isotropic properties, and their ability to be processed using similar technology used for monolithic materials. A large amount of work has been conducted in an effort to characterize the mechanical behavior of particle reinforced metal matrix composites. Under an applied load, the load is transferred from the weaker matrix across the matrix-reinforcement interface, to the higher stiffness reinforcement. Composite strengthening takes place by the reinforcement carrying much of the applied load. The degree of wear is the result of several common factors viz., the rate of corrosion and load, sliding speed, coefficient of friction, hardness and tensile strength. Dry sliding contacts often contain wear particles and mechanically mixed deformed layers (third bodies) whose behavior needs to be understood. If poor bonding exists between matrix and particulate, the reinforced will get detached from the matrix. This detached particle can freely move on the contact zone resulting work hardening and increased material loss.

The aim of this project work was to develop hardness patterns for worn surfaces AA7020/silicon oxide metal matrix composites. To achieve the goals of the paper, the wear tests were conducted on pin-on-disc equipment. The design of experiments was based on Taguchi techniques.

The hardness patterns of AA7020/SiO_2 composites as the replicas of worn surfaces were successfully demonstrated. The wear resistance increases with increase of vol.% SiO_2 nanoparticles in AA7020 alloy matrix due to increased hardness of the composites.

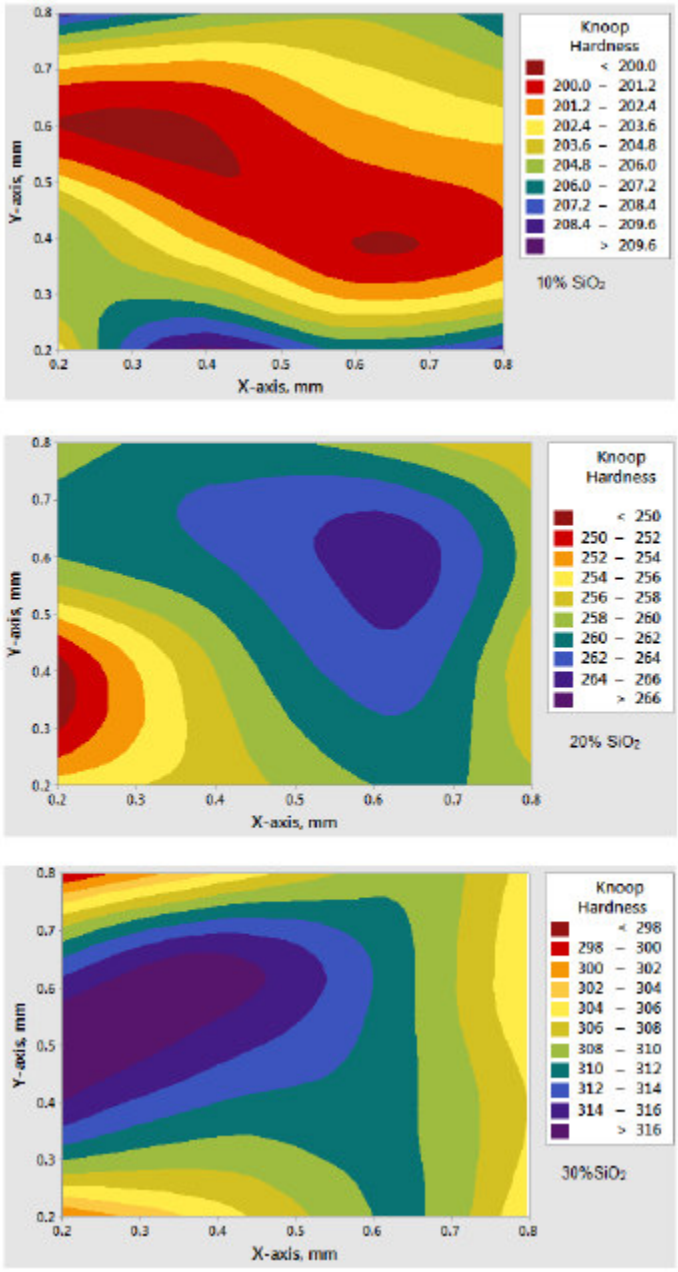

Figure 2: Hardness contours of AA7020/SiO_2 composites after wear test.

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