Effect of Wear on Surface Hardness of AA2024 Alloy/TiC Composites

G. V. R. Kumar
PG Student, Department of Mechanical Engineering, JNT University, Hyderabad

Under the Guidance of Dr. A. Chennakesava Reddy, Associate Professor, JNTUH College of Engineering, JNT University, Hyderabad.

ABSTRACT

Particulate-reinforced composites have become increasingly attractive in recent years for their high-strength and wear-resistant properties. When an external load applied to a composite is partly borne by the matrix and partly by the reinforcement. The reinforcement may be regarded as acting efficiently if it carries a relatively high proportion of the externally applied load. Small powder aggregates are in fact prone to form clusters, losing their capability to be homogeneously dispersed throughout the matrix for an optimal exploitation of the strengthening potential. Wear is one of a number of processes which occur when the surfaces of engineering components are loaded together and are subjected to sliding motion. In general, machine component parts can fail by breakage or by wear, the former being spectacular and sudden, the latter inconspicuous yet insidious. Particularly high wear can occur in mechanisms which operate in conditions of dry friction or in marginally lubricated conditions. Wear is a process of gradual removal of a material from surfaces of solids. The detached material becomes loose wear debris. This detached particle can freely move on the contact zone resulting work hardening and increased material loss.

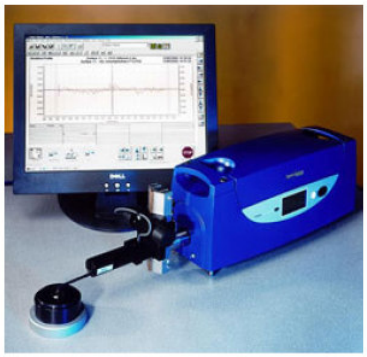

Figure 1: Measurement of surface profile.

The objective of this project work was to develop surface profiles for worn surfaces AA2024/titanium carbide metal matrix composites. To achieve the objective of the paper, the wear tests were conducted on pin-on-disc equipment. The design of experiments was based on Taguchi techniques.

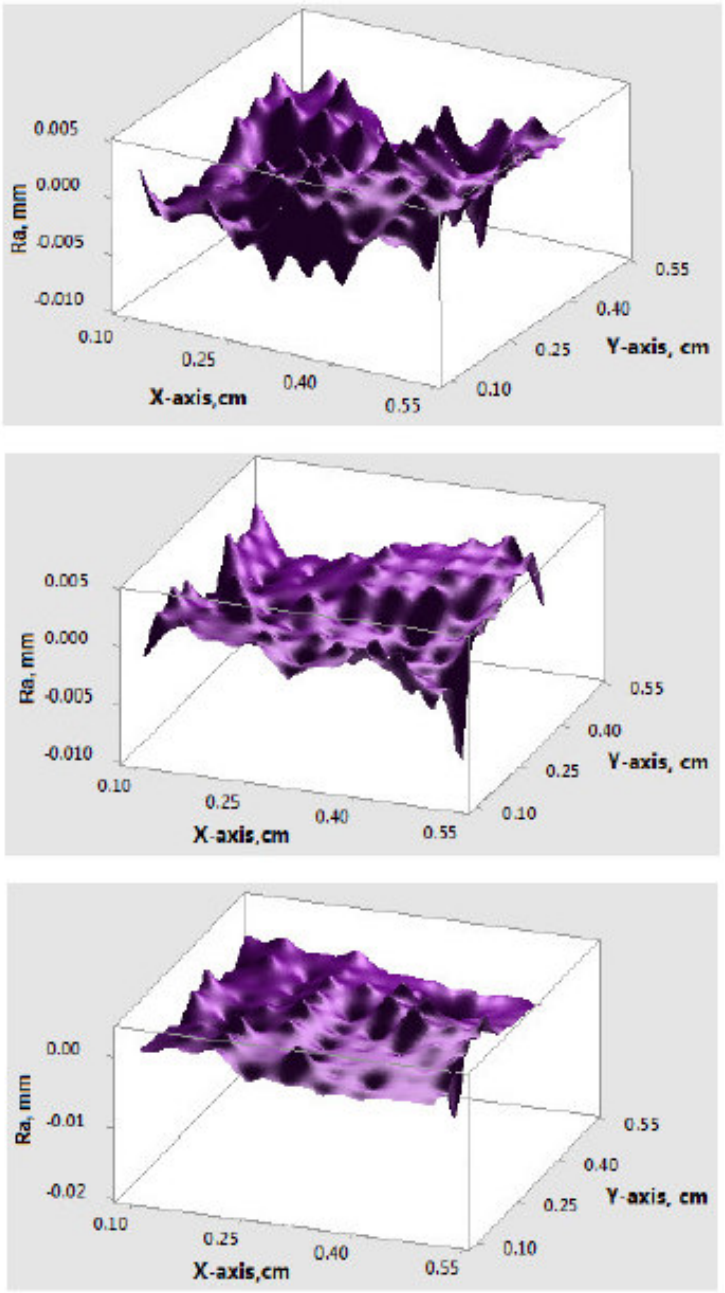

Figure 2: Hardness contours of AA2024/TiC composites after wear test.

The surface profiles of AA2024/TiC composites as the replicas of worn surfaces were successfully verified. The wear resistance increases with increase of vol.% TiC nanoparticles in AA2024 alloy matrix due to increased hardness of the composites.

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