Wear mechanisms of magnesium nanocomposites

S.Kartheesan , B.Shahul Hamid Khan
Department of Mechanical Engineering

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Abstract

At ambient temperature, the dry sliding tribological behaviour of pure magnesium and magnesium nanocomposites reinforced with 0.5, 1, 1.5, and 2 weight percent CaO particles produced using disintegrating melt deposition (DMD) is explored with the help of pin-on-disc apparatus. In order to illustrate the wear nature, four distinct load and sliding velocity ranges were applied. The composites wear enhancement was observed to be superior under 10 N load and sliding velocities of 1.2 m/s and 1.5 m/s. Under lower loads and sliding velocity of 5 N, 8N and 0.6 m/s pure magnesium exhibits lower wear rate as compared to all the reinforced variants. The 0.5 weight percent CaO reinforced composite shows 10% lower wear rate compared to pure magnesium when subjected to higher load and sliding velocity of 15 N and 1.2 m/s. All the reinforced composites demonstrate a lower co-efficient of friction at higher loads and sliding velocities. Field emission scanning electron microscopy (FESEM) with energy dispersive x-ray spectroscopy (EDS) was used to examine the morphology of the worn surfaces in order to determine the various modes of wear mechanism that existed under each test condition. Wear mechanisms such as abrasion, adhesion, and oxidation have also been identified as a predominant mechanism.