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DRY SLIDING WEAR BEHAVIOUR OF SELF-LUBRICATING COPPER MOLYBDENUM DISULFIDE COMPOSITES

Abstract

Molybdenum disulfide (MoS2) is the most frequently used solid lubricant in space tribology because it produces the lowest friction coefficients ever measured in vacuum, as well as a long lifetime and low wear rate. The traditional method of providing solid lubrication is to deposit a thin film of MoS2 on a metal surface of a machine component. However, this approach exhibits an inherent disadvantage that the surface film only has a finite lifetime. The most attractive alternative is to fabricate a bulk metallic material that is reinforced with solid lubricant. Such form of "built-in" solid lubrication provides replenishment of solid lubricant as wear continuous, leading to an improved lifetime of the components. In the present work, a copper molybdenum disulfide composite was fabricated by cold spray and its tribological performance was investigated by in situ tribometry, which permits observation of real-time friction and wear processes occurring at "buried" sliding interfaces. Third body physical and chemical processes, such as forming, loss, replenishment of MoS2 transferfilm and tribofilms, as well as sliding-induced chemical change were observed for sapphire sliding against Cu-MoS2 composites. It was demonstrated that a small amount of solid lubricant (1.8 0.99 wt.

This work provides an understanding into friction and wear mechanisms of MoS2 reinforced metal matrix composites subjected to dry sliding testing. It exhibits lower friction and much longer endurance, therefore has a potential to be used for space tribological applications.