Characterization of Pelletized MoS_2 Powder Particle Detachment Process

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A recently postulated concept of friction between solids states that the process exhibits elements of quasi-hydrodynamic lubrication in which the wear particles shed from one or both surfaces form an interface layer acting as a lubricant. Pellets were formed by compacting MoS_2 powder. A series of pellet-on disk tests were conducted to intentionally deposit wear particles on to a disk. The purpose of the tests are to aid in characterizing the particle detachment process of the pellet. This process consists of analyzing the transfer film, wear and frictional behavior of the pellet. This work also seeks to show that a MoS_2 pellet can transfer a film capable of exhibiting tribological characteristics similar to those of liquid lubricants. For example, some tests were correlated with a dimensionless grouping of variables known as the Sommerfeld Number, to suggest the presence of quasi-hydrodynamic behavior in powder films. The pellet parameters that were analyzed were the particle size, compaction pressure and the effects of external loading during testing. Some of the conclusions arrived at were that smaller compaction pressures yield smaller friction coefficients and greater normal loads placed on pellets help to ensure the proper performance of the lubricating powder films. Data from the wear rate of the pellet and friction coefficient, in addition to the appearance of the wear particles were studied. An interesting feature of the pellet friction is that the longer the rest period in between test runs, the greater the friction values are at the resumption of testing. The present work is part of a continuing series to demonstrate that the process of so-called ''dry'' friction is not confined to the morphology of the interacting surfaces but that it is also a function of the shear and flow occurring at the interface. [DOI: 10.1115/1.1310158]

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