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Three-body Abrasive Wear of Hard Coatings: Effects of Hardness and Roughness

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ABSTRACT

Industrial applications suffer from abrasive wear in lubricated contacts. Three-body abrasive experiments were conducted on three hard coatings with application in oil and gas industry. Slurry of silica sand hydraulic oil was used to model the abrasive medium. Normal load of 178 N and sliding velocity of 1.92 m/s were applied at the contact for test duration of 30 minutes. In-situ normal and friction forces were obtained using a specialized tribometer. Comparing the friction coefficient and the wear rate reveals the combined effect of surface topography and hardness on the tribological performance of the coatings. XRD, SEM and EDS analyses of the surfaces were implemented to better understand the tribological mechanisms. The obtained data revealed the importance of the crystalline phase formation on the wear rate of the coatings under the tested condition. A simplified analysis of the contact at three-body abrasive conditions was proposed and the results were compared against the experimentally obtained data. Recommendations were made to improve the coatings performance under similar operational conditions.

Keywords: *Hard coating; Three-body abrasive wear; Friction; Roughness*

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