

Frictional and wear behaviour of AlCrN, TiN, TiAlN single-layer coatings, and TiAlN/AlCrN, AlN/TiN nano-multilayer coatings in dry Sliding

Abstract

This paper examines the frictional and wear behaviour of AlCrN, TiN, TiAlN single-layer coatings, and TiAlN/AlCrN, AlN/TiN nano-multilayer coatings in dry sliding. Comparative studies on the coatings sliding in air and vacuum environment at different speeds provided important insight on the effect of oxidation and temperature on the frictional and wear behaviour of the coatings. Among all the single-layer coatings tested in vacuum, TiN gave the lowest coefficient of friction (COF), followed by TiAlN and AlCrN. This indicated that TiN was the most lubricous coating. At 10 m/min in ambient air in which oxidation took place, AlCrN gave the lowest COF, followed by TiN and TiAlN. Among the two types of nano-multilayer coatings tested in vacuum and air, the AlCrN/TiAlN produced lower COF. The characteristics of the COF produced by AlCrN/TiAlN and AlN/TiN in vacuum and air was similar to those produced by TiAlN and TiN, respectively. This showed that the COF of these nano-multilayer coatings was governed by TiAlN and TiN. AlCrN exhibited the highest wear resistance. TiAlN had the lowest wear resistance. TiN, TiAlN/AlCrN and AlN/TiN which exhibited similar wear resistance, had lower wear resistance than AlCrN but higher wear resistance than TiAlN. In air, increasing the speed from 10 m/min to 100 m/min resulted in a reduction in COF for all coatings, except AlCrN.