

Dry sliding behaviour of AlCrN and TiN coatings

Abstract

This paper examines the friction behaviour of AlCrN and TiN PVD coatings in atmospheric air and vacuum using a ball-on-disc and a reciprocating tribotesters. Comparative study on the coating sliding in air and in high vacuum environment provides important insight on the effect of oxidation on the friction behaviour of the coatings. Other important factors such as load, sliding velocity, temperature effects on the frictional behaviour of these coatings were also investigated. In the ball-on-disc tests carried out in vacuum, (i) TiN gave lower coefficient of friction (COF) than AlCrN, indicating that TiN was more lubricious, (ii) higher speed resulted in lower COF, and (iii) the COF of both coatings were lower than that produced in air. In ambient air, (i) AlCrN gave lower COF than TiN with high wear debris retention on the sliding interface due to the effect of oxidation, and (ii) higher speed resulted in lower COF, similar to that observed in vacuum. In the reciprocating tests, at low load, increasing the temperature from room temperature to 150 °C resulted in a reduction in the COF. However, at high load, the temperature virtually did not affect the COF. Higher nominal load resulted in lower COF while higher speed resulted in higher COF.