

Effect of roughness of hypo-and hyper-eutectic Al-Si piston alloy on wear characteristics under lubrication

Abstract

The tribological behavior of two Al-Si alloys under the influence of surface roughness average was investigated for the present study. The silicon content of these alloys ranged 10 and 16-wt% Si, and includes hypoeutectic 383 Al alloys and hypereutectic 390 Al alloys. Various surface roughness averages (Ra) of different degrees were verified as well as three different loads 10, 20 and 30 N, speeds 200, 300 and 400 rpm and relative humidity 75%. Different surface preparation techniques result in different Ra values from $(0.2 \text{ and } 4) \pm 0.05$ μm . Surfaces were analyzed through scanning electron microscopy and X-ray dispersive analyses. A pin on-disc apparatus was used for testing in lubrication sliding wear. It was noted that the weighted and volumetric wear rate decreases the degree of roughness and the friction coefficient is a function of the stability state. Wear rate is decreased and the transition from high to low wear increases with an increase in the average surface roughness. It was found that, after the sliding velocity, there was an increase in wear of Al-Si with increasing load, using a scanning electron microscope to study the wear mechanisms. At high speeds, The results of mechanical properties of aluminum-silicon alloys were finally correlated with the amount of silicon in aluminum and secondary processing technique.

Keywords

Aluminum silicon Piston; Hypereutectic; Hypoeutectic; Roughness; Wear