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The effect of ion nitriding temperature on the high-temperature wear resistance of austenitic die-casting mold steel SDHA

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Austenitic mold steels exhibit significant potential in the die-casting industry due to their excellent high-temperature mechanical properties. However, their susceptibility to wear, scratching, and relatively low hardness impairs their wear resistance, thus limiting the application of austenitic steels in die-casting. In this study, austenitic hot-work mold steel (SDHA) with varying surface hardness was produced via ion nitriding at different temperatures. High-frequency ball-on-flat dry sliding reciprocating high-temperature wear tests were performed. The results indicated that nitriding at 560℃ produced the highest surface hardness (1331.6 HV0.2), the greatest average nitride layer thickness (20.7 μm), and the lowest wear rate (11.0×10^{-8} m^2/N at 600℃). The average coefficient of friction (Cof) increased slightly, which was attributed to the increased surface roughness caused by plastic deformation from ion sputtering etching pores and the formation of γN. As the wear temperature increased (from 200℃ to 600℃), a glazed layer, primarily composed of sintered oxides and oxidized debris, formed on the contact surface, effectively reducing the contact area and lowering the Cof by 36.76% compared to low-temperature friction.

Speaker Country

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