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Comparison of friction and wear behavior of different chromium and boron based coatings at high temperatures in ambient air and argon atmosphereMartin Weber¹, Martin Keunecke², Christian Stein², Helge Thomsen²¹Fraunhofer IST, Braunschweig, Germany ²Fraunhofer Institute for Surface Engineering and Thin Films - IST, Braunschweig, Germany

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For most coating applications at high temperatures, e.g. metal forming or cutting processes, high wear resistance in combination with low friction are required. The formation of oxide and diffusion layers at elevated temperatures can affect friction and wear behavior significantly. Comparative ball-on-disk-tests were prepared at temperatures between 500 and 900°C with different coated substrates. Tests were carried out in ambient air as well as under argon cover gas to investigate the influence of oxidation effects. In dependency on the testing temperature and the used gas atmosphere, substrates made from high-speed steel 1.3343 (HS6-5-2C), tungsten carbide WC-Co15 or nickel-based alloys were used. The substrates were coated by magnetron sputtering with chromium based coatings like CrN, CrVN, CrWN and CrAlTiSiN in different compositions. In comparative tests boron based coatings like TiBN, TiB₂ and cBN were investigated. The balls consist of 1.3505 (100Cr6) ball bearing steel. Random tests were done with aluminum and titanium counter bodies. Wear mechanism were examined by light microscopy, stylus surface profiling, REM and EDX. The effect of the coating composition on the coefficient of friction, the adhesive and abrasive wear behavior will be discussed. The formation of oxide layers, e.g. tungsten oxide, can significantly reduce the coefficient of friction.

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friction
wear