Wear protection of elastomers using plasmapolymeric coatings

Dominik Paulkowski, Stefanie Karpinski, Klaus Vissing, Ralph Wilken

Fraunhofer IFAM, Bremen, Germany

dominik.paulkowski@ifam.fraunhofer.de

Sealing components are used in different industries. Beside an improved energy efficiency due to significant reduction of friction there is a demand for enhancing the durability of sealing components. Tribological tests on flat elastomer plates revealed a high wear protection due to applied plasmapolymeric coatings. Lifetime tests were performed as a function of the applied film thickness. Flat elastomer plates were coated with a plasmapolymeric film (SiOxCyHz) in a plasma enhanced chemical vapor deposition (PECVD) process. The film thickness was varied from 0.7 µm to 4.0 µm approximately. The investigated elastomeric substrate material was acrylic rubber (ACM), fluororubber (FKM), and nitrile butadiene rubber (NBR). The friction of elastomers was investigated using an Universal Material Tester (UMT3) system with oscillating Pin-on-plate contact geometry. The counterpart in the tribological tests was a 100Cr6 steel ball with a diameter of 10 mm. The tribological tests were run dry in ambient conditions with a velocity of 200 mm/s with a stroke length of 11 mm. The normal force was varied between 2 N and 40 N investigating in the critical load. The oscillating setup was chosen inducing wear rapidly. It was found that the wear resistance increased with increasing film thickness. Achieving a significant wear protection a minimum film thickness is required depending on the applied load and elastomer type. Film thicknesses in the range of 1 and 2.5µm were recommended.

Keywords
plasmapolymeric coating
elastomer
friction reduction
wear resistance
energy saving