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Reflectance Measured from Worn and Unworn Surfaces of Titanium Compounds

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A sandwich model system consisting of tribological titanium aluminum nitride (TiAlN) on top of 3 μm titanium nitride (TiN) on steel substrate (100Cr6) demonstrates a significant change in the reflectance, based on Fresnel's reflection law, when the tribological TiAlN coating layer is worn down to the 'optical' TiN layer. Layers of up to 3 μm of TiAlN were submitted to a linear reciprocating wear process at the linear tribo-tester at LTDS with up to 60000 repetitive cycles. This resulted in grooves depths of up to more than one μm and widths of mm-size. The worn surface with grooves acted as a scattering medium, but nevertheless a different reflectance of light at 633 nm could be measured between the unworn and worn surface. These results show that optical reflectance monitoring is a potential technique for determining the residual thickness of tribological films prior to complete wear.

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