

PO1083

Tribological properties of the high temperature protective amorphous SiC_xN_y coatingsJan Tomáščík¹, Radim Čtvrtlík²¹Palacký University of Olomouc, Olomouc, Czech Republic ²Joint Laboratory of Optics, Czech Academy of Sciences, Olomouc, Czech Republic

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The superior mechanical properties, low coefficient of friction and oxidation resistance puts the amorphous silicon carbonitride (SiCN) into the position of very promising material for high temperature protective coatings. With the ability to withstand temperatures above 1000°C it can surpass the operational limit of widely used transition metal nitrides based coatings.

Magnetron sputtered a-SiC_xN_y (y≥0) coatings with thickness of approx. 2.5 μm were annealed at temperatures up to 1300°C in air and their performance was thoroughly evaluated prior and after high temperature exposure. The mechanical and tribological properties were tested using nanoindentation technique and scratch test. The latter was used to assess the critical load to failure of coatings and in the advanced modes also to evaluate the gradual degradation of coatings during multiple pass wear test. The detection capabilities of the tribological tests were enhanced by the friction probe and using the continuous acoustic emission record. Especially in the latter case comprehensive analysis was performed. The compositional and structural changes with annealing were evaluated using electron probe microanalysis and various spectroscopic techniques and related to the variation of mechanical and tribological properties.

Keywords

scratch test

nanoindentation

SiCN

high temperature coatings

laser scanning confocal microscopy