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Slip-Rolling and Machining of Engineering Ceramics
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The present study on the slip rolling friction and wear behaviour of self-mated monolithic ceramics and of ceramicceramic-composites under mixed/boundaty lubrication has confirmed the expected influence of the following parameters:

a) the material itself,
b) the machining of the functional surface geometry (cylindrical or convex),
c) the interfacial media and
d) the Hertzian pressure.

Unexpected was the finding that the choice of the interfacial media and the machining e.g. the material removal rate determinate the wear coefficient in the range of several orders of magnitude. All materials tested during this program are suited for slip-rolling contacts in unadditivated paraffinic oil even at a contact pressure of 3 GPa, where as for silicone carbide materials the contact pressure should not exceed 1.5 GPa.

An additional surprising finding was that high strength hipped Yttriurn-stabilized zirconia exhibited in unadditivated paraffinic oil with a rough polished surface after 20 million of revolution NO detectable wear amount, even measured with an AFM. The surface seemed to be unaffected by the cyclic tribological Stress. In contrast, water increased the wear coefficient by 2 to 4 orders of magnitude and enhanced the formation of pitting. In water, silicone nitride exhibited within the ceramics investigated the best wear behaviour.

The initially questions of this research project were answered and a model predicting the mach inability was developed within the consortium with the University of Braunschweig. The model and the results enable the industry to select the different ceramics machining parameters giving high removal rates without increasing the wear coefficients and thus helping reduce the machining costs.

The 140 material couples tested over more than 300 million revolutions were incorporated into the numerical tribological data collection Tribocollect, which can be obtained over BAM, lab. VIII.11. The individual results were published in more than 30 publications.

Future work should be focused on the influence of the machining for higher operating temperatures and on the influence of more common interfacial media on wear coefficient and slip-rolling fatigue resistance.