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EROSIVE WEAR CHARACTERISTICS OF TECHNOLOGICALLY IMPORTANT CERAMIC MATERIALS

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Wear is a major cause of component failure in machines and associated friction is an unwanted energy consumer. Ceramics are much less susceptible to wear than metals. The potential advantage of ceramics compared to metals and polymers include high hardness, chemical stability, strength retention over a large temperature range and low cost. Based on these properties ceramics are largely considered for wear applications such as seals, nozzles, cutting tools, wear pads and liners. This paper presents a study of erosive wear behaviour of some selected technologically important ceramics. Experiments were performed to compare the resistance to erosion under a fixed set of experimental conditions and also to study the dependence of erosion on particle size distribution and slurry loading of the erodent particles.

Pressureless sintered Ca, Y, Yb and Nd a/b-sialon ceramics with different a/b ratios, hot pressed Ca and Y-a/b-sialons, b-sialons, Si_3N_4, SiC and CeO_2 stabilised ZrO_2 were used as sample materials. a-alumina was used as the controlling sample to ensure identical test conditions. For this study, a simple slurry pot tester was constructed and SiC particles in distilled water was used as the erodent slurry. Three different slurry loadings were prepared with three different particle size distributions of the erodent particles. Erosion of the specimens was determined as a function of time by measuring the mass loss.

All the a/b-sialon ceramics showed a superior resistance to erosion. Particularly the hot pressed a/b-sialons showed better resistance than the pressureless sintered materials. The sialon ceramics with a higher a content showed higher erosion resistance. The other ceramics showed less resistance to erosion than the a/b-sialons and can be ranked in a descending order as b-sialons, SiC, Si_3N_4, a-alumina and CeO_2 stabilised ZrO_2. However, these ceramics showed better erosion resistance than that reported for hard steel. This investigation also revealed that the parameters such as the particle size distribution and the slurry loading play an important role on the erosive wear. The erosion rates and hence the cumulative erosions were increased with the increasing of the particle size and also with the increasing of the slurry loading.