

# **Tribo-chemical effects in water lubrication of zirconia ceramics**

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It is well known that the wear and friction behaviour of ceramics can be significantly improved by using them in water or humid air rather than in dry atmosphere. Accordingly, various ceramics have found many water-lubricated applications. In spite of this, the effect of the pH of the aqueous media on the wear and friction behaviour has not been investigated in detail. In our recent work, we have looked at the effect of pH on the wear and friction behaviour of alumina ceramics. The results showed that the wear vary by as much as one order of magnitude and the coefficient of friction by a factor of 3, depending on the conditions. In the present study, we have investigated the wear behaviour of zirconia ceramics under similar conditions, i.e. in different aqueous media within a pH range of 0.9 to 13. Based on the results of reciprocating sliding tests, we found that the wear of zirconia ceramics varies by one order of magnitude, while the coefficient of friction is between  $\approx 0.4$  and  $\approx 0.8$ , depending on the conditions. We have also observed that different wear surfaces are generated for different pH values, and these surfaces have a diverse effect on the wear and friction behaviour. Wear mechanisms were established by employing surface topography analyses and scanning electron microscopy. The chemical and electrochemical effects under the selected tribological conditions are discussed to explain the observed behaviour.

**Key words:** zirconia, alumina, wear, pH, iso-electric point, surface charge, zeta potential