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DISCUSSION

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It is good to see research being carried out on the origins of friction. The role of plastic strain or fracture produced in the surface and near surface region is an important one to consider. Certainly, this is a reasonable source for the loss of energy. The curve in Fig. 8 shows the role of interacting surface asperities on the coefficient of friction for alumina on CVD diamond. Other researchers also find a similar friction characteristic for natural diamond on CVD diamond, CVD diamond on CVD diamond, and other materials on CVD diamond in air.

It must be borne in mind in all quantitative discussions of friction that the precise value of coefficient of friction depends critically on the experimental conditions under which it is measured; in some cases, to quote a single value for coefficient of friction is very misleading. For example, moisture in air increases the coefficient of friction for silicon nitride in contact with CVD diamond film. This increase in friction is due to the formation of silicon oxides layer on the surface of the silicon nitride in humid air. On the other hand, the coefficient of friction for natural diamond in contact with CVD diamond is not susceptible to moisture.

Finally, it is found that the coefficients of friction for CVD diamond film in contact with natural diamond or CVD diamond are considerably higher in vacuum than in air. We now have ample evidence that the friction properties of CVD diamond films are similar to those of natural diamond in various environments, such as air, nitrogen, and vacuum.

Authors' Closure

We thank Dr. Miyoshi for his thoughtful comments. We agree that the friction and wear properties are also significantly affected by the operating environment and the mating material. For instance, silicon nitride form silicon oxide layer in humid air and change the friction, as mentioned by the discussor. We have selected alumina which is softer as compared to diamond, to study the effect of polishing of diamond on the wear of a soft mating material. The friction and wear properties of diamond films in different environments such as humid air, dry air, nitrogen, and vacuum are significantly affected by the type of mating material.

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