Discussion of the Paper: Optical In Situ Micro Tribometer for Analysis of Real Contact Area for Contact Mechanics, Adhesion, and Sliding Experiments

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Abstract The article by Krick et al. [1], describes an optical in situ tribometer that was used to study the contact area of an elastic sphere loaded against a transparent rigid flat under various loading conditions. A few comments relevant to the presented tribometer and study are in place for the benefit of the readers interested in this field of contact mechanics.

Keyword Tribometer · Contact mechanics · Optical tribometer · In-situ measurements

A very similar optical in situ tribometer with almost identical features was described by Ovcharenko et al. [2] as early as 2006. This earlier tribometer was used to extensively investigate the contact mechanics of spheres of different materials and diameters loaded against a transparent rigid flat under various loading conditions [3–7]. Elastic–plastic normal loading–unloading was reported in Ref. [3] for copper and stainless steel spheres with diameters in the range of 2.38–15 mm. Figure 11 in Ref. [3] shows the same general behavior as that presented in Fig. 4b of the article by Krick et al. [1]. The effect of combined normal and tangential loading was studied in Refs. [4, 5] showing the increase of contact area (junction growth) due to the addition of tangential loading. An interesting observation regarding the nature of the contact condition and the mechanism of the junction growth was reported in Ref. [5]. Moreover, creep of spherical contact, which could perhaps also occur in the present study [1],

was investigated in Ref. [6], and junction growth under reciprocating tangential loading was studied in Ref. [7]. A comparison of the experimental results in Ref. [3–6] with previously published theoretical models showed good agreement. When presented in a proper dimensionless form, those experimental results validated the universal nature of the corresponding models.

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