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Discussion

Elastoplastic Contact Conductance Model for Isotropic Conforming Rough Surfaces and Comparison With Experiments[1]

A Further Discussion by C. V. Madhusudana[2] and Y. Z. Li[2]. We have read carefully the response made by the authors to our discussion and note that several points still need satisfactory clarification.

1 Ratio of Elastoplastic to Plastic Contact Areas in a Single Contact Spot

For a single contact spot, ϵ_c^* is a function of the load and, since f_{ep} is a function of ϵ_c^* only, it follows that the ratio A_{ep}/A_p, the ratio of elastoplastic to plastic contact areas, must be a function of the load. It is only for the contact between rough surfaces that the authors' argument, that this ratio is independent of load, sounds plausible. The confusion has arisen, perhaps, because the authors have made no attempt to distinguish between the ϵ_c^* as defined by Eq. (26) for rough surfaces and the ϵ_c^* as defined by Eqs. (2) and (3) for a single contact spot.

2 The Mean Contact Size

In Eq. (24), the authors used the elastic hardness derived by Mikic (1974) for conforming rough surfaces. This then leads to Eq. (25) which indicates that the mean contact size a is a function of the radius of curvature β and the mean slope m, and is independent of the load. Equation (36), which is identical to Eq. (26), was then derived from Eq. (25).

In the iterative procedure to determine P/H_{ep}, Eqs. (31) to (37), two mean contact spot sizes were used: one in Eq. (33), which says that the contact radius is a function of the mean separation λ and is, therefore, a function of load (see Eq. (34)), and the other in Eq. (36), which assumes that the contact radius is independent of load. Which one of these is true?

3 A Typographic Error?

There seems to be an error in the very first sentence of the response. It implies $\beta = 1/(2\beta)$, which is absurd. Note that β has dimensions of length.

Reference

Mikic, B. B., 1974, "Thermal Contact Conductance: Theoretical Considerations," *Int. J. Heat Mass Transfer*, Vol. 17, pp. 205–214.

[1] By M. R. Sridhar and M. M. Yovanovich, published in the ASME JOURNAL OF HEAT TRANSFER, Vol. 119, No. 1, pp. 3–9; discussion and author's response published in the ASME JOURNAL OF HEAT TRANSFER, Vol. 119, No. 2, pp. 392–393.

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