

Thermoelastic contact mechanics of functionally graded materials

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This paper investigates the thermoelastic frictional contact of functionally graded materials (FGMs) with arbitrarily varying thermoelastic properties. It is assumed that a rigid insulated punch is sliding over the surface of an FGM coated half-plane with a constant velocity, which generates frictional heating at the contact interface with its value proportional to the contact pressure, frictional coefficient and sliding velocity. The transfer matrix method and the Fourier integral transform technique are employed to convert the problem into Cauchy singular integral equations which are then numerically solved to obtain the contact stress, in-plane stress and surface temperature. The effects of the gradient index, Peclet number and friction coefficient on the thermoelastic contact characteristics are discussed in detail.

Keywords: Contact mechanics; Functionally graded materials; Frictional heating; Coating; Punch