APCOM & ISCM
11-14th December, 2013, Singapore

Contact analysis for an anisotropic half-domain with micropatterns considering friction

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In the present study, a contact problem between a spherical indenter and a half-anisotropic elastic region with a micropattern is solved under normal and tangential forces considering friction. Surface Green's function, the discrete convolution and the fast Fourier transform (DC-FFT) method are used to calculate displacements on a contact area, and the conjugate gradient (CG) method is employed for calculating a contact pressure, the contact area, shear tractions, and a stick-slip region, respectively. The influences of the shape and density (the ratio of the pattern area per a unit area) of the micropattern and of material anisotropy in the substrate on the friction property for the substrate are investigated. In this study, the substrate with circle- and square-micropatterns are used for the analysis. As the result, it is found that the shear traction concentrates at the edges and corners of circle- and square-patterns, respectively. The apparent friction coefficient varies with the direction of the anisotropic principal axis.

Keywords: Contact analysis, Anisotropic materials, Micropatterns, Friction, Green function