

Molecular Adhesive Contact for Indenters of Non-Ideal Shapes

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The JKR and the DMT theories of contact in the presence of forces of molecular adhesion are developed to describe contact between an indenter and an elastic sample, when the distance between the solids is described as a monomial function of an arbitrary degree d . Exact formulae are obtained in the framework of the former theory, while an integral equation is derived for the latter theory. In the case of integer degrees d , the obtained analytical formulae coincide with the known solutions. The integral equation is solved numerically. The results are applied to depth-sensing nanoindentation of soft and hard materials by indenters of non-ideal shapes, when the shape function is a monomial function of degree d , $1 < d < 2$. It is shown that both the adhesive molecular interaction and non-ideality of the shape may affect the results obtained using the standard Hertzian approach.

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