

ADHESIVE CONTACT NEAR FULL CONTACT: GENERALIZED TABOR PARAMETER, LOADING AND UNLOADING FULL SOLUTION

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ABSTRACT

Recently (Ciavarella, 2015), the first author has obtained a model for adhesive contact near full contact under the JKR assumptions, extending the Xu et al (2014, 2017) model. The model shows, in the common case of low fractal dimensions, an 'unbounded' adhesion enhancement when larger and larger upper "truncation wavenumber" is considered in the spectrum of roughness, i.e. when we increase "magnification". Here, using a more general Maugis-Dugdale model, we show that a generalized multiscale Tabor parameter can be defined which shows a transition to a non-hysteretic regime, dependent on the root-mean-square (rms) slope of the surface. The contact area returns in the "fractal limit" to the adhesionless one. Two examples of rough surfaces from the literature are considered to show the full dependence on magnification of the adhesive solution. The choice of the truncation of the spectrum remains

fundamentally arbitrary. The full loading and unloading solution is provided, which is the first analytical solution to adhesive rough contact problem fully considering the difference between loading and unloading regimes in the best of the authors' knowledge.

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