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Elastocapillarity in Soft Matter: From Wetting and Adhesion to Interface Reinforcement ZHEN CAO, ANDREY DOBRYNIN, University of Akron — Elastocapillarity, the fine interplay between capillary and elastic forces, determines contact phenomena in soft matter at micro- and nano-scales. Using a combination of the molecular dynamics (MD) simulations and theoretical calculations, we developed a unifying model able to describe a wetting-like and adhesion-like contact between a particle and substrate. In the framework of this model a deformation of a particle or substrate is a universal function of the elastocapilliary number – γ^*/G^*a, where $\gamma^*$and $G^*$are effective surface tension and effective shear modulus of the particle/substrate system, and $a$is a radius of contact. In the adhesion regime the elastocapillary number is smaller than unity, while in the wetting regime this parameter is larger than unity. This approach was extended to elucidate conditions of interface reinforcement between soft materials by nanoparticles. The prediction of the model were confirmed by MD simulations showing that the work required for separation of two gels glued together by nanoparticles could be up to 10 times larger than the work of adhesion between two neat gel surfaces.

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