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Gluing Gels by Soft Nanoparticles[1] RYAN SAYKO, Allegheny College , ZHEN CAO, HEYI LIANG, ANDREY DOBRYNIN, The University of Akron —
Nanoparticles have been recently shown to act as effective adhesives between two soft materials. Using a combination of theoretical calculations and molecular dynamics simulations, we investigated the contact mechanics of a soft nanoparticle at the interface of two gel-like surfaces. Depending on the nanoparticle size and the elastic modulus of nanoparticle and gels, the reinforced interface could be in a bridging or Pickering state. The equilibrium radius of contact, and the deformations of nanoparticle and gels are controlled by a dimensionless parameter - elastocapillary number, describing both adhesive and wetting regimes. We calculated the potential of mean force between the equilibrium contact state and the separated state using the Weighted Histogram Analysis Method. Simulation results show that soft nanoparticles could achieve a larger work of separation compared with a rigid nanoparticle.

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