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Microgel Interactions over Full Temperature Range XIN YONG, SHENSHENG CHEN, Binghamton University — An effective interaction potential unifying the behavior of thermoresponsive microgel particles across the phase transition temperature is a fundamental yet unsolved question in soft matter physics. Using coarse-grained simulations, we quantitatively probed the pair interactions between microgels having a lower critical solution temperature. We find that the polymer-solvent interfacial tension is indispensable for capturing microgel interactions at the critical temperature and higher. Once contacting each other, microgels act like soft repulsive particles at low temperatures. In contrast, an effective attraction and the formation of a connecting gel bridge were observed at contact between shrunken microgels at high temperatures. We propose an analytical model that couples an inverse power law repulsion and temperature-dependent surface energy to unify microgel interactions over the full range of temperatures and overlapping distances. The effective interaction represents a competition between the elastic repulsion from polymer deformation and the surface energy induced attraction. The new elastocapillary model agrees well with the simulation results and overcomes limitations of traditional models that consider only elastic response of soft particles.

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