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Capillary interactions in nano-particles suspensions DOBRIN BOSSEV, GARFIELD WARREN, Indiana University — We have investigated the structures formed by colloidal particles suspended in solvents at volume fractions below 10% and interacting through capillary bridges. Such systems resemble colloidal gas of sticky nano-spheres that form pearl-necklace like chains that, in turn, induce strong viscoleasticity due to the formation of 3-D fractal network. The capillary force dominates the electrostatic and Van der Waals forces in solutions and can bridge multiple particles depending of the volume of the capillary bridge. Small-angle neutron scattering (SANS) is used to study nanoparticles with an average diameter of 10 nm in polar and non-polar organic solvents at ambient temperatures. Computer simulations of a pearl necklace-like chain of spheres is conducted to explain the structure factor when capillary bridges are present. We have also studied the properties of the capillary bridge between a pair of particles. The significance of this study is to explore the possibility of using capillary force as a tool to engineer new colloidal structures and materials in solutions and to optimize their viscoelastic properties.

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