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Directing Colloidal Structure Using a Quench-Disordered Large Mesh Polymer Gel RYAN JADRICH, KENNETH SCHWEIZER, University of Illinois at Urbana-Champaign — The use of a quench disordered template, such as a large mesh gel composed of long rigid rod polymers, may provide a powerful tool to mediate inter-particle interactions, structure, thermodynamics and properties of colloidal/nanoparticle suspensions. We employ the Replicated Reference Interaction Site Model integral equation approach to study a model system composed of a quenched rod or fiber gel immersed in a spherical colloid fluid. The theory predicts a sharp wetting-like transition with increasing colloid-fiber attractions accompanied by strong thermodynamic and colloid packing changes. By increasing the colloid-colloid attractions at constant colloid-fiber interactions, greatly enhanced adsorption onto the gel network and a well-defined state of maximum adsorption is predicted. This phenomenon suggests a strategy for avoiding macrophase separation and instead achieving a sharp, cusp-like transition driven by large density fluctuations of order the long rod length. The possibility of exploiting these phenomena to create responsive and functional colloidal assemblies that can be switched between electrically conductive and non-conductive states is explored. The approach can be generalized to nonspherical colloids, both chemically homogeneous and Janus.

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