

Abstract Submitted  
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**Directing colloidal assembly and a metal-insulator transition using quenched-disordered polymeric networks** ANH PHAN, University of Illinois at Urbana-Champaign, RYAN JADRICH, The University of Texas at Austin, KENNETH SCHWEIZER, University of Illinois at Urbana-Champaign — Replica integral equation and effective medium theory methods are employed to elucidate how to massively reconfigure a colloidal assembly and realize equilibrium states of high electrical conductivity at low physical volume fractions [1]. This is achieved by employing variable mesh size networks of rigid rod or semiflexible polymers as a templating internal field. By exploiting bulk phase separation frustration and the tunable competing processes of colloid adsorption on the low dimensional network and fluctuation-driven colloid clustering in the pore spaces, distinct spatial organizations of greatly enhanced particle contacts can be achieved. As a result, a continuous, but very abrupt, transition from an insulating to metallic-like state can be realized via a small change of either the colloid-template or colloid-colloid attraction strength. Polymer conformational fluctuations are found to significantly modify the physical adsorption process and hence the ability of colloids to organize along the filamentary network strands. Qualitatively new physical behavior can emerge as the pore size approaches the colloid diameter, reflecting strong frustrating constraints of the template on colloidal assembly.

[1] R.B. Jadrich and K.S. Schweizer, Phys.Rev.Lett., 2014.

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