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Thiol-Functionalized Gold-Nanoscale Organic Hybrid Materials-Attractive to Soft glasses[1] AKANKSHA AGRAWAL, LYNDEN ARCHER, Cornell University — We report on the flow properties of self-suspended nanoparticles based on gold nanoparticles densely grafted with polyethylene glycol methyl ether thiol(PEG) chains. We studied the effect of temperature, olume fraction and polymer chain length on the transition from attractive glass to soft glassy flow behavior. Gold nanoparticles densely grafted with short PEG-thiol chains(MW 800,2kDa and 6kDa)are shown to form self-suspended systems over a range of polymer grafting densities and particle volume fractions,φ.Transmission electron and atomic force microscopy measurements reveal that the particles are uniformly dispersed. Oscillatory shear measurements performed on low φ systems show a two-step yielding behavior reflecting bond breaking and cage breaking transitions at the nanoscale; both characteristics of soft glassy materials dominated by attractive forces. With increased temperature a transition to one-step yielding and subsequently back to two-step yielding is observed. At high φ a single yielding transition and soft glassy flow behavior are observed. We employ SAXS, vibration spectroscopy, thermal analysis, and rheology to interrogate the configuration state of the tethered chains and particle-particle interactions in detail.

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