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Yielding and Shear Induced Structure Formation in Emulsions with Attractive Interactions ZHEN SHAO, AJAY NEGI, CHINEDUM OSUJI, Yale University, OSUJI LAB TEAM — The yielding behavior of colloidal suspensions is a strong function of inter-particle interactions. Recent results [Pham et al. 2006, 2008] indicate that attractive colloidal glasses display a two-step yielding due to inter-particle bond rupture followed by particle cage escape. From this perspective, we examine the yielding behavior of an oil-in-water emulsion system with attractive interactions using dynamic bulk rheology. In strain sweep experiments, after a limited linear regime, the system yields with a pronounced bump in the viscous modulus, a sharp decrease in the elastic modulus and a crossover between the two. The yielding response is marked by bond-breaking at low volume fractions and bond-breaking accompanied by cage escape above a critical concentration. An increase in the complex modulus is observed at yet higher strains (>100%), with both the elastic and viscous components showing small frequency dependent peaks. The onset, peak strains and peak stress display different dependences on volume fraction. We speculate that this display is due to the formation of shear induced structures at high strains and advance a simple model for this behavior.

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