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Yielding of colloidal glasses and gels GEORGE PETEKIDIS, NICK KOUMAKIS, IESL-FORTH, Crete, Greece, JOHN BRADY, Chemical Engineering, Caltech, USA — Simple hard sphere glasses exhibit a single step yielding under oscillatory or steady shear that is related with the entropic elasticity and breaking of the near neighbours cage. However, when attractions are added, for example in the form of a short range depletion, the system yields in a two step manner. It has been proposed that these processes reflect an initial particle bond breaking and a subsequent breaking of an attractive cage [1]. Here we attempt to elucidate the origin of the two step yielding by examining the rheological response of a series of samples with the same interparticle attraction ranging from high volume fraction attractive glasses to the low volume fraction colloidal gels ($0.1< \phi <0.6$). We examine the linear and non-linear properties with both oscillatory and steady shear rheology. We find that the transition from a highly concentrated attractive glass to a low volume fraction colloid-polymer gel takes place gradually with the cage breaking process being substituted by a cluster dominated process as the volume fraction is decreased. Rheological measurements are complemented by Brownian Dynamics simulations in order to gain insight on the microscopic rearrangements and structural changes that occur during yielding. Different ranges of attraction are implemented both experimentally and in simulations to validate the main mechanisms involved.

[1] K. Pham et al. J Rheology (2008).

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