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New activated dynamical regimes in dense suspensions of attractive uniaxial colloids RUI ZHANG, KENNETH SCHWEIZER, University of Illinois at Urbana-Champaign — Our microscopic theory of cooperative translational-rotational activated glassy dynamics of hard uniaxial particles [PRE,80,011502(2009); JCP,133,104902(2010)] is extended to treat short range attractions. For small aspect ratio dicolloids, a plastic glass (PG) state exists for weak attractions, but is destroyed beyond a critical attraction strength resulting in a new dynamic triple point (fluid, PG, gel), and two novel re-entrant behaviors: PG-fluid-gel, and repulsive glass(RG)-PG-gel. A new mixed "glass-gel" state also emerges characterized by center-of-mass and rotational angle localization parameters of intermediate magnitude. At high volume fractions, increasing attraction transforms the RG to an attractive glass (AG) characterized by a dynamic free energy surface with a gel-like localization state but a glass-like saddle point, and a non-monotonic variation of relaxation time and diffusion constant. AG dynamics is of a 2-step nature where physical bonds first break followed by hopping over a glass-like barrier. At high attractions a sharp crossover from a gel to AG with increasing volume fraction is predicted. As the particle aspect ratio grows, the PG state is destroyed, and translational motion becomes increasingly more important for escaping dynamical traps.

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