Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Shear bands at the Jamming Transition: The role of Weak Attractive Interactions EHSAN IRANI, Institute for Theoretical Physics, Goerg-August University of Göttingen, PINAKI CHAUDHURI, Institute of Mathematical Sciences, Tamil Nadu, India, CLAUS HEUSSINGER, Institute for Theoretical Physics, Goerg-August University of Göttingen — We study the rheology of a particulate sytem close to jamming in the presence of weakly attractive interactions. Lees-Edwards boundary conditions are used to simulate a shear-controlled flow. In addition to Bagnold scaling at large shear rates, the attraction results in a finite yield stress in the limit of small shear rates. In the yield regime a fragile solid is formed and the rheology can be explained by a scaling argument that exploits the vicinity to the isostatic state. In the transition region the shear stress develops a minimum, which (in large enough systems) leads to the formation of persistent shear bands. These features are rationalized by a scenario that involves the competition between attraction-induced structure formation and its break-down because of shearing. Properties of shear bands are studied in order to reveal the physical mechanisms that underly the non-monotonic flow curve and the flow heterogenities in the transition region. This work may help to elucidate the origin of shear bands in different materials with finite and short-ranged attractive forces.

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Date submitted: 14 Nov 2014 Electronic form version 1.4