A statistical physics approach for the flow transition of yield stress fluids

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Abstract

In this talk I will discuss several mesoscopic approaches, such as lattice models [1] and mean-field descriptions [2] for the yielding transition and the non-linear rheology of driven yield-stress materials. Despite the fact that this type of models require some phenomenological ingredients, notably the detailed local yielding rules, they have been shown to match several aspects of the mechanical response very well, such as avalanche statistics [1], mechanical noise descriptions [3] and rheological features, like for example shear banding [4] and creep dynamics. Further the mesoscopic approach provides an ideal tool to test basic assumptions for different flow phenomena and can serve as a bridge to large scale descriptions of the complex yielding dynamics.

Driving rate dependence of avalanche statistics and shapes at the yielding transition
Chen Liu, Ezequiel Ferrero, Francesco Puosi, Jean-Louis Barrat and Kirsten Martens, Phys. Rev. Lett. 116, 065501 (2016).

Probing relevant ingredients in mean-field approaches for the athermal rheology of yield stress materials
Francesco Puosi, Julien Olivier and Kirsten Martens, Soft Matter 11, 7639 (2015)

Rheology of athermal solids: Revisiting simplified scenarios and the concept of mechanical noise temperature
Alexandre Nicolas, Kirsten Martens and Jean-Louis Barrat , EPL 107, 44003 (2014).

Spontaneous formation of permanent shear bands in a mesoscopic model of flowing disordered matter
Kirsten Martens, Lydéric Bocquet, Jean-Louis Barrat, Soft Matter, 8 (15), 4197 (2012).

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