Thermally-activated creep and fluidization in flowing disordered materials

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Abstract

When submitted to a constant mechanical load, many materials display power law creep followed by fluidization. A fundamental understanding of these processes is still far from be-
ing achieved. Here, we characterize creep and fluidization on the basis of a mesoscopic vis-coplastic
model that includes thermally activated yielding events and a broad distribution of energy barri-
ers, which may be lowered under the effect of a local deformation. We relate the creep ex-ponent
observed before fluidization to the width of barrier distribution and to the specific form of stress
redistribution following yielding events. We show that Andrade creep is accompanied by local
strain hardening driven by stress redistribution and find that the fluidization time depends expo-
nentially on the applied stress. The simulation results are interpreted in the light of a mean-field
analysis, and should help in rationalizing the creep phenomenology in disordered materials.
Reference:
S. Merabia and F. Detcheverry, "Thermally-activated creep and fluidization in flowing disordered materials", EPL, in press 2016

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