Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Squirt flow in highly deformable multi-porosity materials[1]
PATRICK KURZEJA, KATIA BERTOLDI, Harvard Univ — Squirt flow is a phenomenon that typically occurs in porous structures with more than one length scale, e.g., in fractured rocks or multi-porosity organic material. Due to a heterogeneous pore space, external compression induces fluid flow between the pores of different compressibility and finally causes a delayed and attenuated response. While this phenomenon is well understood in natural materials, little it is known about how to trigger and control it in artificially architected materials.
Here, we will first show that squirt flow can occur in highly deformable, fluid-filled artificial materials if overall fluid drainage is prevented and then we will demonstrate how this can be controlled. Interestingly, this viscous-flow mechanism opens avenues for the design of smart materials with delayed stress-strain response (e.g., for high-impact applications) or additional attenuation regimes (e.g., below frequencies of internal resonance).

[1]Supported by DFG Grant KU 3351/1-1

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Date submitted: 31 Jul 2015 Electronic form version 1.4