Experimental evidence of non-affine deformations in disordered materials

The wide use of heterogeneous materials requires understanding of their deformation both for the fundamental knowledge of their mechanical behaviour and for engineering applications. The disordered structure of these systems causes nonuniform stress propagation leading to a deviation from the affine character of deformations even in the reversible elastic regime. Emergence of non-affine zones and subsequent intermittent structural rearrangements determine the mechanical response of amorphous materials. The development of non-affine deformations in heterogenous systems has been demonstrated in numerous simulations, however only few works studied it experimentally. We have designed an experiment based on the diffusive wave spectroscopy (DWS) that allows compensating the affine part of the applied deformation and reveal the deviation from the linear response. The results on the thermal expansion of a granular material will be presented.