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Particle structuring in stretched soft/hard nanocomposite YANN LE DIAGON, UPMC, STEPHANIE MALLARINO, CHRISTIAN FRETIGNY, CNRS, PPMD TEAM — The deformation mechanisms of nanocomposites made of disordered rigid inclusions imbedded in a soft matrix are rather complex as the local geometry and mechanical responses are very intricate. Atomic force microscopy (AFM) is used to analyze the surface of a model elastomer submitted to uniaxial traction. Since the sample contains monodisperse spherical rigid inclusions, images easily yield statistical data on the positions of the fillers. As expected, it is observed that the displacement field is affine at large scales. At short range, important deviations are observed. The 2D-structure factors present the characteristic "butterfly" patterns, similar to the neutron scattering patterns obtained on many deformed heterogeneous materials. We show that mechanical confinement of the inter-particular matrix regions must be taken into account in order to explain the results. Finally AFM images reveal higher order correlations: Fillers are observed to be arranged along lines which are roughly perpendicular to the stretching direction. Such a characteristic organization seems to be characteristic of the soft/hard disordered systems.

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