

Fast, high-resolution, non-destructive and quantitative characterization methods are needed to develop materials with tailored properties at the nanoscale or to understand the relationship between mechanical properties and cell physiology. This review introduces the state-of-the-art force microscope-based methods to map at high-spatial resolution the elastic and viscoelastic properties of soft materials. The experimental methods are explained in terms of the theories that enable the transformation of observables into material properties. Several applications in materials science, molecular biology and mechanobiology illustrate the scope, impact and potential of nanomechanical mapping methods.