
Microscopic Insights into the Thermo-Mechanical behaviour of Glasses

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Abstract

Little is known about the thermo-mechanical couplings taking place within amorphous materials. This is partly due to the fact that the relevant scales involved in these processes are of the order of a few nanometer, therefore very difficult to access experimentally. However, different experimental setups (Raman and Brillouin Spectroscopy, Elastic and Anelastic X-ray scattering, or micromechanical testings) can give partial information on the microscopic mechanisms, as soon as they can be supported by numerical simulations at the atomic scale. In this talk, I will review the microscopic processes that appeared in the last decades to be responsible for the mechanical behaviour as well as thermal transport processes in amorphous materials, at different temperatures. The microscopic basements for the continuum elasto-plastic behaviour of glasses, as well as their effective visco-elastic behaviour, will be discussed in details, together with the behaviour of heat carriers responsible for their low thermal conductivity. This talk will end with a focus on the possibilities offered by materials design at the nanometer scale for the control of thermo-mechanical behaviour of disordered materials.

Keywords: Glasses, Amorphous materials, Constitutive laws, Elasto, visco, plastic response, Thermal conductivity

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