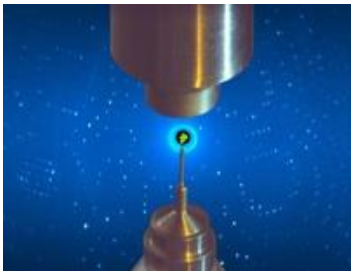

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Effects of glassy matrices on the protein-like dynamical transition of PNIPAM

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Hydrated proteins undergo a dynamical transition (DT) at $T_d \approx$ 180-230 K. The transition is associated with the activation of protein dynamics on the ps-ns time scale, suitably detected by Elastic Incoherent Neutron Scattering (EINS). The DT has been also observed in other biomolecules and is deemed necessary for biological functionality. Surprisingly, a DT has been recently found in a non-biological system, i.e. poly(N-isopropylacrylamide) (PNIPAM). Despite its synthetic nature, PNIPAM is able to reproduce the complex solvent-macromolecule interactions at the basis of biological processes. The generality associated with the observation of the DT suggests a prominent role of the solvent. In proteins, the main features of the DT are critically affected by the presence of *stabilizing* compounds. The formation of a glassy stabilizing matrix inhibits the protein mobility by shifting T_d toward higher temperatures and by reducing the amplitude of associated protein motions. Interestingly, the constraining action on protein fast dynamics is thought to be related to the bioprotectant ability promoted by stabilizers over longer timescales, although the microscopic details of these processes are unclear. By means of EINS techniques, we exploited the bio-mimic behaviour of PNIPAM by investigating the fast dynamics of PNIPAM chains when in presence of water/stabilizer mixtures. As in proteins, we found a tight connection between polymer dynamics and characteristics of the solvent.

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