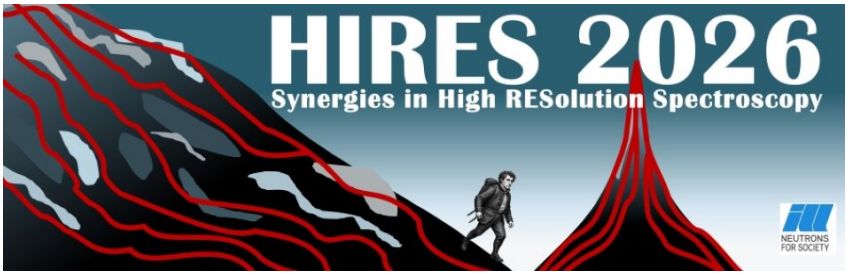

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Neutron Scattering Characterisation of Gel Systems for Cleaning Delicate Artwork

Gels with tailored confining and release properties of solvents are essential tools for cleaning sensitive precious artefacts. Understanding thoroughly the transport phenomena at the molecular level in these systems is crucial for improving formulations, not only for cultural heritage conservation but also for applications such as drug delivery. To this end, we used QENS to probe the polymer-network dynamics and the transport of confined water in hydroxyethylmethacrylate (HEMA) hydrogels. Our investigation focused on the effects of crosslinking (chemical vs physical) and water content. The results show a distribution of relaxation processes in the polymer network, mainly linked to the side-chains. Water dynamics occur as a hydrogen-bond governed process with a jump-diffusion mechanism, and the interaction with the polymer matrix significantly slows the dynamics compared with bulk water and other confined systems. Such a strong interaction results as well in a fraction of water that appears as immobile at the investigated timescale. Higher hydration levels are associated with an increased mobility of both the water and polymer network. At equal water content, physical gels show slower relaxation and a smaller explored space than chemical gels, for the pHEMA network. Water mobility is strongly reduced in chemical gels at low hydration, while at high hydration the mobilities converge, albeit with shorter residence times in chemical gels. More recently, we have extended our investigations to castor-oil organogels, using SANS and QENS. These systems are suistainable and specifically designed for tackle the challenge of cleaning water sensitive artifacts in modern and contemporary art.

Session

Soft Condensed Matter

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