

Effect of selective deuteration on particle compressibility for SANS studies with contrast variation

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Selective deuteration is a key procedure that enables contrast variation in neutron scattering experiments used for the structural characterisation of synthetic and bio-relevant colloids. It relies on the assumption that selective deuteration does not alter the size, structure, or compressibility of the microgels. However, a poor experimental knowledge is available on the effects of partial deuteration on the properties of soft colloids. Therefore, the influence of selective deuteration is investigated through the analysis of the structure and softness of poly-N-isopropylacrylamide-based (pNIPAM) microgels.

Small-angle neutron scattering with contrast variation is employed to determine the bulk modulus of microgels synthesised from partially deuterate monomers with varying degrees of deuteration (isotopic substitution of 3, 7 or 10 atoms of hydrogen by atoms of deuterium). Dynamic light scattering and viscosimetry techniques are also used to determine the swelling ratio and individual mass of the different microgels.

Our results show that, the structural differences induced by monomer deuteration make the partially deuterated microgels harder. The higher the degree of deuteration, the harder the microgel becomes.

Keywords:

pNIPAM Microgels, Selective Deuteration, SANS, Contrast variation, Bulk modulus

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