Beitrag ID: **83** Typ: **Poster**

Distribution of Cross-linkers in Microgels obtained by Contrast variation in Small Angle Neutron Scattering

Dienstag, 17. September 2024 21:20 (20 Minuten)

Aditi Gujare1, Jonas Runge2, Stefanie Uredat2, Julian Oberdisse1, Domenico Truzzolillo1, Thomas Hellweg2

1 Soft Matter Physics, Laboratoire Charles Coulomb, University of Montpellier, Montpellier, France
2 Physical and Biophysical Chemistry, Bielefeld University, Bielefeld, Germany

Smart membranes have applications in wastewater treatment and separation[1]. These membranes show permeability depending on the external stimuli, such as thermoresponsive microgel-based membranes. Such membranes can be prepared by UV cross-linking, electron beam cross-linking, or chemical cross-linking. A free-standing membrane made of NIPAM microgels has been reported, which are cross-linked with a secondary UV-sensitive crosslinker HMABP. These free-standing thermoresponsive membranes are resistant above their VPTT(33℃) and show permeability of ions below it[2].

To understand the incorporation of HMABP in the microgel particles, we performed contrast variation Small Angle Neutron Scattering(SANS) experiments. We synthesized microgels with deuterated monomers (NIPAM/NIPMAM) and non-deuterated cross-linkers BIS and HMABP. We performed contrast-matching experiments to see how these cross-linkers are distributed within a microgel particle(Figure-1). With changing scattering length densities of the solvent, the particles show similar scattering behavior when the D-monomers are scattering, thus confirming that they form the microgel. Whereas when the deuterated monomers are matched, and the cross-linkers are highlighted (which is at 100%D2O), there is a change in the scattering behavior which suggests an inhomogeneous distribution of the cross-linkers inside the microgels.

In the high-q region, both the NIPAM and NIPMAM-based microgels show similar scattering behavior at different solvent scattering length densities(except at 100%D2O). But in the low-q region, the scattering behavior of NIPMAM-based microgels, the samples above 50%D2O when the cross-linkers are highlighted, scatter very differently. This again suggests the inhomogeneous distribution of cross-linkers, which is different in NIPMAM- as opposed to NIPAM-based microgels.
It is hoped that these distributions of cross-linkers in microgels based on deuterated monomers can be used to describe the distribution of cross-linkers in non-deuterated microgels as these are comparable in size and also show similar thermoresponsive behavior with a VPTT between 33℃-44℃ (depending on the monomer NIPAM/NIPMAM) and reach a fully collapsed state at 60℃. However, the scattering behavior is different when comparing the deuterated microgels with non-deuterated ones because, in a given solvent scattering length density(100% D2O), the non-deuterated monomers are highlighted along with the cross-linkers while the deuterated ones are contrast matched with the solvent.

[1]S. Uredat, A. Gujare, J. Runge, D. Truzzolillo, J. Oberdisse T. Hellweg, Phys.Chem.Chem.Phys.26(2024)2732
[2]M.Dirksen, T. Brändel, S. Großkopf, S. Knust, J.Bookhold, D. Anselmetti, T. Hellweg, RSCAdv.11(2021)22014-22024.

Autor: GUJARE, Aditi (Université de Montpellier)

Co-Autoren: TRUZZOLILLO, Domenico (Université de Montpellier); RUNGE, Jonas (Bielefeld University); OBERDISSE, Julian (Université de Montpellier); UREDAT, Stefanie (Bielefeld University); HELLWEG, Thomas (Bielefeld University)

Sitzung Einordnung: Mounting Posters, Beer and light Dinner

Track Klassifizierung: Soft Matter