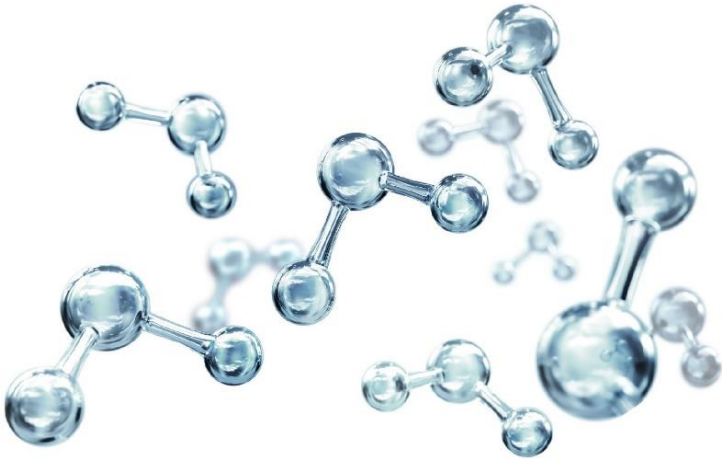
Seminar

CMWS Centre for Molecular Water Science

14th of October 2021
12:00 h

Zoom Virtual Meeting:
https://desy.zoom.us/j/84703564086

Meeting-ID: 847 0356 4086
Password: 570173



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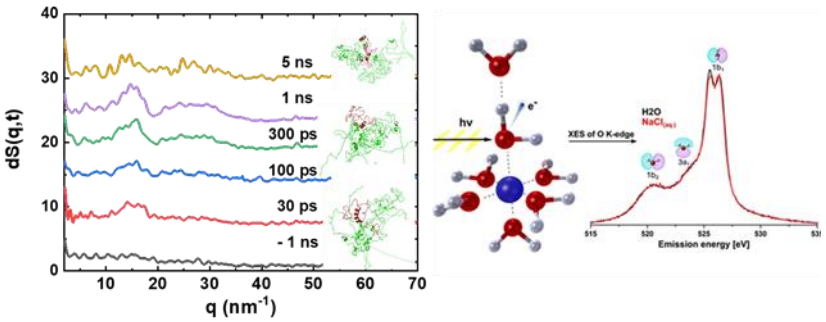
How Hydrophilic are Hydrophobic Hydrogels from Disordered Proteins? – from Phenomenological to (Ultrafast) Mechanistical Studies

By definition, a hydrogel is “a crosslinked hydrophilic polymer that does not dissolve in water. They are highly absorbent yet maintain well defined structures.” (*Encyclop. Chem. Technol.*). Since proteins are also polymers, in this lecture I will present optical and X-ray studies of an almost 100% intrinsically disordered protein that belongs to the group of nuclear pore proteins. According to the properties of this disordered protein, it cannot adopt protein-typical well-defined secondary structure elements, which are also required for hydrogel formation. Nevertheless, this very hydrophobic protein immediately forms hydrogels when dissolved in water. Time-resolved optical and X-ray studies will lead us out of this paradox. I will discuss how this protein, due to its very specific interaction with water, forms metastable and intermediate structures that define its intermediates and metastability in its coating function. The found autocatalytic mechanism of self-assembly will be embedded in a Schuster-Eigen hypercycle including the femto/picosecond to minutes time regime. Finally, I will discuss the influence of Hofmeister's series on the structure of water - and whether and how "salting-in" and "salting-out" affects hydrophilicity - and thus hydrogel formation.



Overview of Presented X-ray Methods:

[1] *Ultrafast Time Structure Imprints in Complex Chemical and Biochemical Reactions,* Chapter 15 in U. Bergmann et al. (eds.), *Fundamentals and Application of Free Electron Lasers*, Royal Chemical Society, Oxford, 301-322, (2017).
[2] *Development of Ultrafast X-ray Free Electron Laser Tools in (Bio)Chemical Research*, in T. Salditt et al. (eds.), *Nanoscale Photonic Imaging*, *Springer Series: Topics in Applied Physics* 134 (2020).
[3] *Structure Time Correlations Studied with Pulsed High-flux X-ray Sources,* in K. Amini et al. (eds.) *Structural Dynamics with X-Ray and Electron Scattering*, AIP-Publishing (2021 / 2022).