

Physikalisches Kolloquium Universität Kiel

Wintersemester 2018 / 2019

Dienstag, 30. Oktober 2018

Dr. Katrin Amann-Winkel

(Department of Physics, Stockholm University, Sweden)

“Does water consist of two liquids? How X-rays reveal water’s mysteries”

Water is ubiquitous and the most important liquid for life on earth. Although the water molecule is seemingly simple, various macroscopic properties of water are most anomalous, such as the density maximum at 4°C or the divergence of the heat capacity upon cooling. The fundamental origin of these anomalies is yet to be fully understood [1]. Computer-simulations suggest that the anomalous behaviour of ambient and supercooled water could be explained by a two state model of water. An important role in this ongoing debate plays the amorphous forms of water [2]. Since the discovery of two distinct amorphous states of ice with different density (high- and low density amorphous ice, HDA and LDA) it has been discussed whether and how this phenomenon of polyamorphism at high pressures is connected to the occurrence of two distinct liquid phases (HDL and LDL) [3]. X-ray scattering experiments on both supercooled water [4] and amorphous ice [5] are of major importance for our understanding of water. In my talk I will give an overview on our recent experiments on micrometer-sized supercooled water droplets [4] and amorphous ices [5]. Among other techniques, X-ray correlation spectroscopy (XPCS) was used to study the dynamics in amorphous ice around the hypothesized glass transition temperature. Our results are consistent with the hypothesis of a liquid-liquid transition between HDL and LDL [3,4,5].

[1] Nilsson, A. & Pettersson, L.G.M., *The structural origin of anomalous properties of liquid water*. 6, 8998, Nature Comms (2015)

[2] K. Amann-Winkel et al., *Water’s controversial glass transition*, Rev. Mod. Phys. 88, 0110002 (2016)

[3] P. Gallo, K. Amann-Winkel et al., *Water: a Tale of Two Liquids*, Chem. Rev. 116, 7463-7500 (2016)

[4] K.H. Kim, A. Spaeh et al., *Maxima in the Thermodynamic Response and Correlation Functions of Deeply Supercooled Water*, SCIENCE 358, 1589 (2017)

[5] F. Perakis, K. Amann-Winkel et al., *Diffusive dynamics during the high-to-low density transition in amorphous ice*, PNAS 114, 8193 (2017)

Der Vortrag beginnt um **16:15 Uhr** im **Hans-Geiger-Hörsaal (LS13-R.52)**
des Physikzentrums.

Ab **16:00 Uhr** werden **Kaffee** und **Tee** angeboten.

W.J. Duschl
für die Dozenten der Physik

Gastgeber: Prof. Magnussen