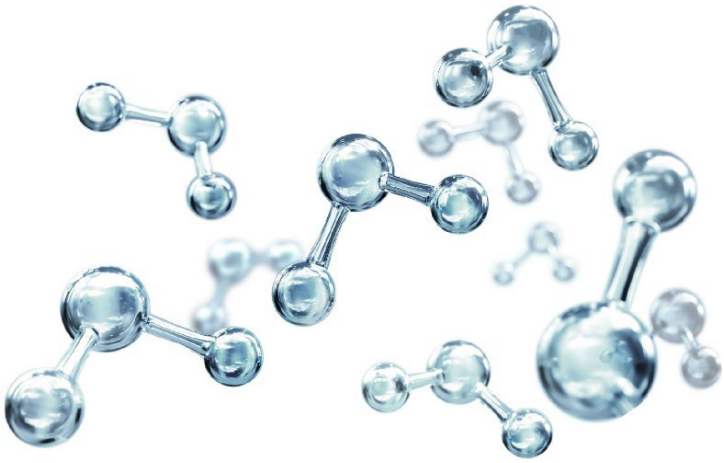
Seminar

CMWS Centre for Molecular Water Science

1st of December 2022
16:00 h

Zoom Virtual Meeting:
https://tuhh.zoom.us/j/82631283465
Meeting-ID: 826 3128 3465
Password: 978444



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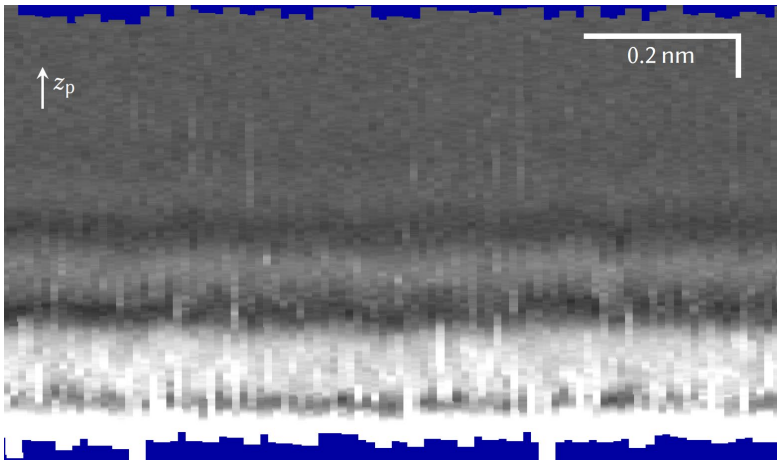
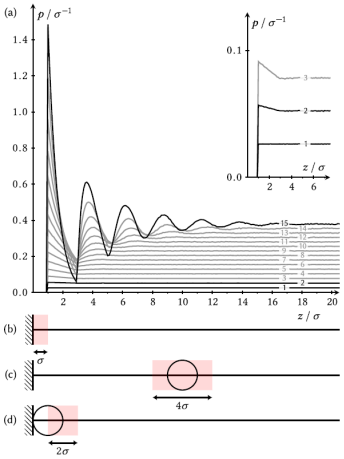
Hydration layer formation at graphite surfaces: attraction or confinement?

Dynamic atomic force microscopy (AFM) is a versatile tool for investigating surfaces at the atomic level. When performed in a three-dimensional volume at a solid-liquid interface, information about the solvation structure at the interface can be obtained [1]. Implementing this three-dimensional imaging technique [2] allows for directly mapping the interfacial hydration structure at various surfaces such as calcite [2], dolomite [3] or graphite [4].
At solid surfaces, hydration layers are typically formed. This is also true for graphite surfaces (left figure). The physical origin of these layers is usually ascribed to (i) confinement of the water at the interface and (ii) attraction of the water to the surface. While confinement is a general property at solid surface, attraction is specific to the given system. In this talk, layer formation by confinement will be discussed in general (right figure), *i.e.*, it is explained how layer formation can be explained even in the absence of attraction. With the help of molecular dynamics simulations, however, it is shown that confinement alone does not cause the layer formation in the specific case of graphite surfaces. Thus, attraction between water and graphite is required to explain the layers observed on graphite at ambient conditions.





[1] T. Fukuma, Y. Ueda, S. Yoshioka, H. Asakawa, Phys. Rev. Lett. 104 (2010) 016101
[2] H. Söngen, M. Nalbach, H. Adam, A. Kühnle, Rev. Sci. Instrum. 87 (2016) 063704
[3] H. Söngen *et al.*, Langmuir 33 (2017) 125

[4] H. Söngen *et al.*, A. Kühnle, Phys. Rev. B 100 (2019) 205410