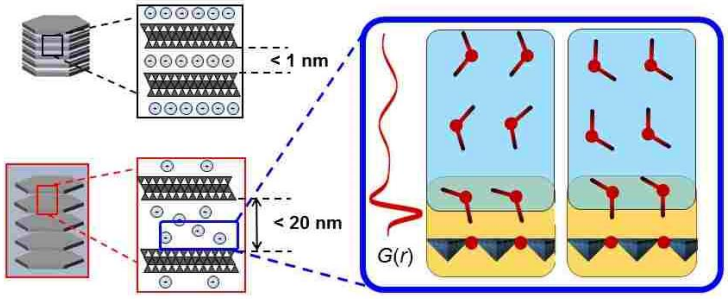
PhD position (m/f)

Role of solvent in the delamination of 2D nanomaterials

Keywords: Solid-liquid interfaces, X-ray scattering, structure of liquids

In the workgroup for Mesostructured Materials we have a close look at the structure of solid-liquid interfaces. Such interfaces play an important role in applications like catalysis or delamination processes. For instance, delaminated layered silicates are employed as gas barrier materials in food packaging, but the role of the solvent during delamination not yet understood.

The degree of delamination and the distance between two 2D-silicate sheets are fine-tuned in swelling processes. The charge of the sheets and the composition of the swelling liquid play a crucial role.[1] Recently we could show that solvent molecules restructure over ca. 5 molecular layers around colloidal nanoparticles in various solvents. High-energy X-ray scattering allowed us to gain structural insight into the structure and extent of those solvation shells.[2] The solvents at the surface of silicate sheets also restructure during swelling. Now we want to pursue the role of the solvent during the swelling process. In detail, we want to analyse how far the **restructured interface** extends into the interlayer space and understand how the solvent structure changes during the delamination.



X-ray view into the liquid structure between two colloidal, swollen silicate platelets

The position includes the following tasks:

- **Characterisation of the solvent structure** at the surface of layered silicates in **X-ray scattering experiments at large-scale research facilities**
- Correlation of the surface charge with the solvent structure (zeta potential)
- Interpretation of the scattering data (derivation of the **pair distribution function**) by means of theoretical structure predictions from molecular dynamics (MD) simulations

Your background can be in either chemistry, physics, material science, nanotechnology, or similar. You should be interested in interdisciplinary work. Explicit experience with scattering experiments or MD simulations is not mandatory. Remuneration according to TVL-E 13.

Bayreuth has 70,000 inhabitants and distinguishes itself by its proximity to the climbing area of the Franconian Switzerland. Within the university, most modern equipment is available for further sample characterization (NMR, TEM, XRD/PDF, SAXS, …).

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[1] S. Rosenfeldt, *et al.*, *Langmuir* **32** (2016) 10582

[2] M. Zobel, *et al.*, *Science* **347** (2015) 292