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Combined SAXS/SANS studies of functionalized interfaces

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The combination of small angle X-ray and neutron scattering (SAXS, SANS) allows a detailed analysis of the mesoscopic structure of colloidal dispersions. It is, however, the atomic and molecular structure of the interface between the nanoparticles and the dispersion medium that governs in many cases the formation, stabilization, and function of the nanoparticles.

In this contribution it will be demonstrated that it is possible to detect the details of stabilizing interface layers as e.g. the acetate layer of ZnO quantum dots in ethanolic solution, to discover and tailor the stabilizing mechanism of gold nanoparticles in aqueous solution crowded by CTAB micelles, and to observe the ligand (oleic acid –porphyrins) exchange and their molecular orientation at the interface of TiO₂ nanoparticles by simultaneous evaluation of SAXS and contrast variation SANS experiments.

However, worldwide no instrument for simultaneous SAXS/SANS measurements is available so far. This limits the applicability of the combined analysis of SAXS and SANS data significantly especially for metastable systems. The first combined SAXS/SANS instrument which is currently under construction and will be installed in spring 2019 at the D22 instrument of the ILL (Grenoble, France) will be introduced briefly.

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