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Self-association of clay platelets with or without other colloids as probed by SAXS and TXM imagery

Friday, 20 May 2022 11:00 (30 minutes)

We had the privilege to collaborate time to time with Isabelle. We have been able to appreciate her exceptional scientific and human qualities. We had a common interest deciphering colloidal "portrait de phases" of mixed systems involving clay platelets and other partners such as magnetic spherical particles [1] or surfactant lamellar phases [2-3]. These works have paved the road to new researches in our group and I will present today one of them, related to self-association of clay platelets during flocculation by inorganics salts [4]
Combining SAXS patterns and Transmission X-ray Microscopy (TXM) projection images of unperturbed water suspensions, it was observed than small angle scattering evolves as q-α on a large range of correlation lengths. Moreover, depending of the nature of the inorganic salt in water suspension, the exponent α can vary from 2 to 4. Meanwhile, as α increases, the pseudo 001 correlation peak is reinforced. An analytic model is proposed to explain such an evolution of SAXS patterns, showing that a cross-over from ($\alpha \geq 3$) to ($\alpha < 3$) appears without any geometrical transition but strongly depends on the lateral stacking disorder. Actual extension of this work to the case of concentrated associations of clay platelets and spherical particles is underway and will be outlined.
These different works reinforce our feeling that a bottom-up approach involving SAXS, SANS and 2D-3D imagery technics is highly needed for these types of multiscale complex systems.

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2. I. Grillo, P. Levitz, Th Zemb, Insertion of small anionic particles in negatively charged lamellar phases., Langmuir 16, 4830-4839 (2000).
3. I. Grillo, P. Levitz, Th Zemb Insertion of small anisotropic clay particles in swollen lamellar or sponge phases of nonionic surfactants Eur. Phys. E5, 377-386 (2001).
4. L.J. Michot., I. Bihannic., F. Thomas,B. S. Lartiges., Y. Waldvogel., C. Caillet., J. Thieme, S.S. Funari and. P. Levitz P., Coagulation of Na-Montmorillonite by Inorganic Cations at Neutral pH. A Combined Transmission X-ray Microscopy, Small Angle and Wide Angle X-ray Scattering Study, Langmuir, 29, 3500−3510, (2013).

Primary author: LEVITZ, Pierre (CNRS)

Co-authors: MALIKOVA, Natalie (CNRS); VYDELINGUM, Sivagen (CNRS-Sorbonne Université); MICHOT, Laurent (CNRS)

Presenter: LEVITZ, Pierre (CNRS)

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