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Imogolite nanotubes: a 2D x-ray scattering study of films of oriented samples

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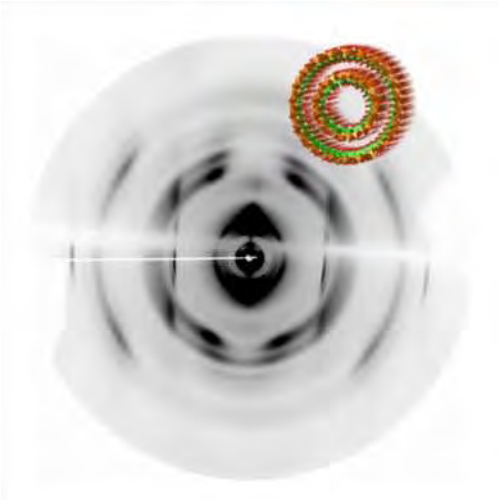
Inorganic nanotubes represent an emerging class of nanobuilding blocks. Among them, imogolites are alumino-silicate or alumino-germanate nanotubes with well controlled diameter and helicity. As such, they constitute a model platform for the study of molecular interactions and confinement at the nanoscale, complementing the one constituted by carbon nanotubes. We focus here on double-walled alumino-germanate nanotubes, discovered very recently [1]. They are formed of two concentric tubes (figure inset), with respective internal diameters of 1.6 and 3.1nm and up to 1 micron in length [2]. We report the first experimental study, using wide angle x-ray scattering, performed on films of oriented nanotubes (figure). Structural changes of the nanotubes and behavior of the confined water under heating are investigated in-situ. The study of oriented samples gives new information that is not available with powder diffraction. Above all, the contribution to the scattering signal of internal and external tubes can be separated as well as the translational/rotational correlations. The use of wide image plate detectors allows one to access large area of the reciprocal space in a single image. Simulations of the two-dimensionnal scattering diagrams will be presented. A key question, the correlation between internal and external tube, which is of great interest for understanding friction properties at the nanoscale, will be discussed.

[1] *Maillet et al., J. Am. Chem. Soc., 132, p. 1208-1209 (2010),* ***[2]*** *Amara et al. Chem. commun., 49, p. 11284-11286 (2013)*



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