

## X-ray analysis of ultrastructure of vitrified biological objects

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Cryogenic sample environments allow investigations in the X-ray 'water window' of 284 – 540 eV which is of tremendous interest for microscopy and coherent scattering due to the high contrast of organic matter with respect to the aqueous background. In addition, no fixatives and stains are required and thus real in-situ analysis becomes possible. We present coherent diffractive imaging and X-ray micrographs of bacteria and compare the data against small angle X-ray scattering on large ensembles. Most measurements have been conducted at the synchrotron BESSY II, U49 PGM2 with our dedicated scattering chamber *HORST*. As example for the approach, ultrastructure changes in bacteria induced by stress conditions such as different environmental conditions and biocides. We show that imaging and scattering provide complementary results as latter provides information averaged over thousands of cells and can thus provide insights of a very high statistical quality.