PAUL SCHERRER INSTITUT PSI

Swiss Light Source

Events

Friday, March 12, 2010 11:00 WBGB/019 [SLS Seminar]

Synchrotron-Based Micro-Imaging in 2D and 3D Using Different Contrast Modalities

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The special properties of synchrotron light sources, such as intense flux, high brilliance and partial coherence allow for pushing the limits of hard X-ray imaging methods: full-field microtomography can be extended by more sophisticated contrast mechanisms to image weakly attenuating objects or elements with identical absorption contrast. Digital radiography can be used for in situ investigations of fast processes on the millisecond scale, sampled with a spatio-temporal micro resolution. A focused synchrotron beam in combination with scanning tomographic techniques probes a sample with respect to e.g. its local diffraction behaviour. This talk focuses on instrumentation and applications of synchrotron micro-imaging exploiting different contrast modalities. Experiments and developments were performed at the BAMline BESSY-II), TopoTomo (ANKA) as well as ID15a, ID19 and ID22 (ESRF).
By developing further indirect 2D X-ray detectors, radiography in vivo of living species as well as in situ of liquid metal foams has been performed. The latter allowed for the first time to image a coalescence event by using an image acquisition speed of 40 000 frames/s. Optimising besides the detector as well the beamline instrumentation makes micro-tomography feasible even at moderate flux light source, i.e. dedicated multilayer monochromators can be used. Examples to apply micro-tomography are bioceramics in regenerating bone and early pore formation in foams. Subsequent 3D image analysis by means of algorithms based on transformations known from stochastic geometry derives quantitative results like spatial correlations between different constituents within the volume image.

[Back to seminar schedule]