Open lecture:

"METAL FOAMS – SOFT MATTER IN THE LIGHT OF HARD X-RAYS"

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Solid metal foams are produced by admixing gas bubbles to a particle-stabilised liquid alloy, thus generating a liquid metal foam, and solidifying the foam after. The solid foam is what engineers are interested in but the processes in the liquid precursor during foam generation have to be studied because they determine the structure of the final product. The various available processing routes for metal foams will be presented and the open fundamental questions in research identified. In order to learn more about the processes in liquid metal foam we investigate these by three different X-ray imaging methods: tomography is used to obtain 3D images of quasi-static liquid foams and to allow for an analysis of particle rearrangements during foaming. Slow radioscopy with an X-ray micro-focus tube provides sequences of projected images at frame rates ranging typically from 1 to 10 fps. This method provides information about the large scale evolution of the volume and shape of the foam and to count events such as bubble coalescence under different experimental conditions. Fast radioscopy using a brilliant synchrotron X-ray source increases time resolution and allows for imaging at frame rates up to 5000 fps. In this way the collapse of individual structures in the foam can be tracked and bubble rearrangements be studied in great detail. We present a selection of such experiments and derive conclusions concerning foam stability and the optimisation of foaming processes.