

Selected research topics in Biomedical Engineering:

Medically Relevant Experiments with Synchrotron Radiation

Location: Grosser Hörsaal, ZLF, University Hospital Basel

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Nanostructure surveys of macroscopic bone specimens by small-angle scattering tensor tomography

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Abstract. Scanning an X-ray probe over a bone sample provides structural and compositional information similar to conventional microscopy. Replacing visible light by X rays, however, enlarges the accessible length scale to the entire nanometer range and even below. For bony tissues with their heterogeneous nanoscale structures over centimeters, small-angle X-ray scattering (SAXS) is particularly valuable. SAXS patterns are exact mean values of the illuminated volume, *i.e.* in each scan point. The method is, therefore, complementary to high-resolution real-space techniques including electron microscopy. Analyzing the localized scattering pattern, one can map the density and orientation of nano-anatomic features such as hydroxyapatite crystallites and collagen fibers. Combining this technique with computed tomography and applying it to bone, one can reconstruct the hydroxyapatite platelets and collagen fibrils to determine structural parameters, such as thickness and orientation. The talk will also show studies of bone formation at implant materials.

Curriculum. Marianne Liebi has a background in food science. She obtained the Ph.D. from ETH Zurich, Switzerland in 2013 for the characterization of soft-matter using neutron scattering, electron microscopy and birefringence methods. From 2013 to 2016, she was postdoc of the coherent X-ray scattering group at the Swiss Light Source and dealt with SAXS imaging focusing on tensor tomography. Subsequently, she moved to Sweden as postdoc at MAX IV. As assistant professor, Marianne Liebi started her own research group at Chalmers University of Technology in Gothenburg, Sweden. Her research has aimed at the development of X-ray imaging to materials with a hierarchical structure. Most recently, she became a scientific group leader within the Center of X-ray Analytics at Empa, St.Gallen, Switzerland and an adjunct associate professor of the Physics Department at the Chalmers University of Technology in Sweden.