Selected research topics in Biomedical Engineering:
Medically Relevant Experiments with Synchrotron Radiation
Wednesday, November 18, 2020, 14:45-15:45, via zoom

Brilliant X-rays for the imaging of nanostructures in medical research

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Abstract. Nanostructured materials give rise to X-ray scattering at small angles when illuminated in transmission with X-rays at a wavelength of about 1 Angstrom (0.1 nm). Third-generation synchrotron sources, including the Swiss Light Source, produce highly brilliant X-rays, which can be exploited for scattering experiments on tissue biopsies. For example, the illumination can be efficiently focused to a few micrometers, which allows for spatially-resolved small-angle X-ray scattering (SAXS) to survey samples such as a whole tooth section, providing local information about collagen abundance and orientation. Another application of high-brilliance X-rays is the use of the coherent portion of the beam, which provides an illumination with a well-defined wavefront. The scattering recorded from a coherent beam is speckled and is directly related to the nanostructure arrangement within the illuminated volume. Smart approaches such as X-ray ptychography enable us to retrieve structures with a spatial resolution below 10 nm without the need of X-ray lenses. Combined with tomography, biological tissues extending several tens of micrometers have been imaged. This presentation will provide an introduction to spatially resolved SAXS and X-ray ptychography, providing examples of medical research.

Curriculum. Ana Diaz studied physics at the University of Oviedo, Spain, spending the last year of studies as an Erasmus exchange student at the University of Tübingen, Germany. Subsequently, she earned her Ph.D. degree in physics at the ETH Zurich, Switzerland, where she developed a method to study ordering in confined colloidal solutions using X-ray diffraction. Then, she moved to France to work as a postdoctoral fellow at the European Synchrotron Radiation Facility in Grenoble, where she applied Bragg coherent diffraction imaging to study strained crystalline nanostructures. Since 2009, Ana Diaz has been working as a beamline scientist at the cSAXS beamline at the Swiss Light Source, Paul Scherrer Institute, Villigen, Switzerland. There she enjoys supporting external users to perform spatially resolved SAXS and X-ray ptychography measurements. Her research interests are the development of X-ray scattering techniques and their further implementation as user experiment.