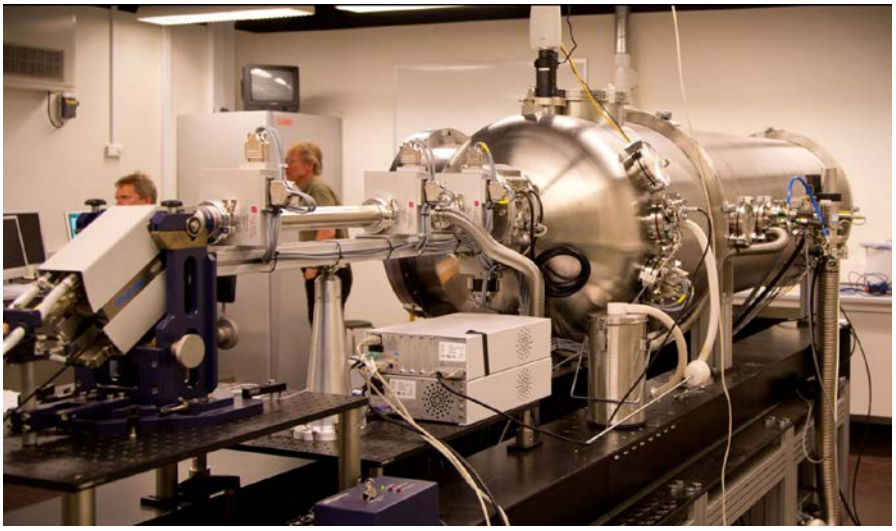
Investigation of interpenetrating polymer networks for drug delivery under mechanical deformation by Small-Angle X-ray Scattering (SAXS)

Master project in the group of Prof. Lise Arleth, Niels Bohr Institute, HCØ

The company Biomodics have developed a patented technique to incorporate a hydrogel into silicone rubber, which is widely used for tubing in biomedicine, for example in urinary catheters used in hospitals. The advantage of Biomodics's material is that the incorporation of hydrogel prevents the formation of biofilms (germs) and that the material potentially can be used for drug delivery. The LINX (Linking Industry to Neutrons and X-rays) group at NBI is involved in a project with the company in which their materials are studied with small-angle neutron and X-ray scattering (SANS and SAXS). One very important aspect is the mechanical properties of the silicone rubber. It has to be soft and flexible, and for a urinary catheter, it is very important that the shape of the balloon in the bladder returns to the same shape after inflation and deflation, so the catheter can be extracted without damage to the urethra. The aim of this project is to investigate the mechanical properties of the material with SAXS while the material is under mechanical deformation. For this we will use the SAXS instrument located at NBI and a stretch-setup that has been developed for the instrument.



SAXS instrument at the HCØ basement.

In the project, the student will have a chance to interact with the collaborators from industry while still being in an academic environment. This is a good chance to get a feel for how academic skills and techniques can be put to work in an industrial research and development setting. During the project you will be embedded in the LINX-group which works with small-angle scattering together with a number of small and large Danish companies.

The student conducting this project will

- Setup and test the stretch-setup at the NBI SAXS instrument.
- Investigate the structure of Biomodics's interpenetrating polymer network samples under mechanical deformation as a function of different material compositions.
- Model the measured scattering patterns to extract information that is useful for the company in their production.

If you are interested or have any questions, contact Erik Brok (e.brok@nbi.ku.dk) or Martin Schmiele (martin.schmiele@nbi.ku.dk). More information on your future work group, Biomodics and LINX can be found at

- www.arlethgroup.nbi.dk
- www.biomodics.com
- www.linxproject.dk