

	Experiment title: Water-swollen perfluorated Ionomer membranes: Ultra-SAXS studies	Experiment number: SC701
Beamline: ID2A	Date of experiment: from: 4/02 7h00 to: 6/02 7h00	Date of report:
Shifts: 6	Local contact(s): Panine Pierre	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): Diat Olivier DRFMC/SI3M/PCI, CEA Grenoble Gebel Gérard “ Rollet Anne Laure “ Rubatat Laurent “		

Report:

Using the Bense&Hart setup on ID2 we succeed with a good statistic (which is very important when the scattered intensity is comparable with the instrumental rocking curve) and with no desmearing (due to the use of crossed analysers) to get the total variation of the ultra small angle upturn observed in Nafion membranes. The analysis in terms of the Debye Bueche model allows to determine the characteristic length of the two phase model observed at the order of 1000Å. Contrast variation with SANS and AFM experiments confirm this approach.

We did not succeed to correlate this intensity upturn with the temperature in order to change the ratio of crystalline parts into the membrane due to some problem with the experimental cell. But the second objective corresponding to the relationship of this upturn with the water content has been achieved. This intensity increase is constant

as a function of the water content or of the nature of the counterion but depends on the material – test with different sulfonated pendant chains or different origin of processes.

An quantitative analysis is still in progress to determine the physical origin of such density fluctuation at this scale of the order of 1000Å.

See below a figure of this intensity upturn for Li⁺ Nafion membrane for different water content. The intensity variation between the USAXS upturn and the roughly q⁻¹ regime is due to the structure factor of elongated polymeric aggregates (Rubatat et al, Macromolecules submitted).

