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Structure of Nafion membranes in humidity

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Nafion membranes are frequently used as membranes in fuel cells and electrolyzers due to their chemical resistivity. In this study, we used Nafion membranes before and after the application. We investigated the structure of Nafion membranes in different humidity conditions using small angle neutron scattering (SANS) and prompt gamma activation analysis (PGAA). The SANS measurements reveal the swelling of the pores with water that base on the analysis of structural correlation peaks. Furthermore, the bare water content is also characterized in terms of the incoherent background. Using hydrogen polarization by spin pumping, a full contrast variation series is measured by SANS. Here, the finite pore size is clearly measured, and by the time dependence of the signals upon pumping, the thickness of the water/polymer interphases is given. PGAA reveals an independent cross check of the water uptake.

Primary authors: BABCOCK, Earl; Dr FRIELINGHAUS, Henrich (JCNS); APPAVOU, Marie-Sousai (Jülich Centre for Neutron Science (JCNS) at Heinz Maier-Leibnitz Zentrum (MLZ), Forschungszentrum Jülich GmbH); SZEKELY, Noemi (Jülich Centre for Neutron Science JCNS); HOLDERER, Olaf; Prof. KOIZUMI, Satoshi (Ibaraki University); Dr NODA, Yohei (Ibaraki University)

Presenter: Dr FRIELINGHAUS, Henrich (JCNS)

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