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Impact of Ageing on Properties of PFSA Ionomers¹ AHMET KUSOGLU, MERON TESFAYR, SHOUWEN SHI, WILL TONG, ADAM WEBER, Lawrence Berkeley National Laboratory — Perfluorosulfonic-acid (PFSA) ionomers are widely used as the solid-electrolyte in electrochemical energy applications due to their remarkable conductivity and chemical/mechanical stability. However, in these various applications, it is not uncommon for the ionomer to be subjected to various operational environmental stressors that could impact their morphology and properties. In this talk, the impact of hygrothermal ageing on both bulk ionomer and ionomer thin films will be discussed. The intrinsic changes to the morphology and properties will be presented including water uptake and swelling behavior as well as nanostructure using both transmission and grazing-incidence small- and wide-angle x-ray scattering. It will be shown how ageing at intermediate humidities (50 to 70% relative humidity) induces higher mechanical properties and subsequently lower water uptake for both bulk and thin film ionomers due to a loss of accessible ionic sites, which are thought to form crosslinks. Ageing at higher and lower relative humidities shows a decrease in these changes. The ionomers to be studied include both Nafion and the short-side-chain analogue by 3M with higher ion-exchange capacity. Our findings provide new insights into how ageing alters the structure/function relationship of ionomers.

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