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Structure and Transport in Ion-containing Polymers under Confinement: Nafion Thin Films

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Our research program has investigated the effect of confinement on the structure and transport properties of Nafion, the most widely used ion exchange membrane material for fuel cell applications. A consistent picture is emerging from a diverse set of measurement platforms, indicating that the morphology of Nafion is dramatically altered upon confinement. As expected, these morphological changes result in a remarkable decrease in the transport of water in these films, which is an indicator of ion transport. Additionally, we show that the processing history of these thin Nafion films has a profound impact on the observed properties. Specifically, thermal annealing and humidity ageing leads to decreased water transport in thin Nafion films, the origins of are still yet not completely understood. This talk will highlight the results of our measurements as well as others that help paint a more complete physical picture of the structure and resulting transport in confined Nafion films.