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Anisotropic Proton Conductivity in Thin Nafion Films KEIJI TANAKA, YUDAI OGATA, Kyushu University, NORIFUMI YAMADA, High Energy Accelerator Research Organization, DAISUKE KAWAGUCHI, Kyushu University, KYUSHU UNIV. TEAM, KEK COLLABORATION — Proton conductivity of polyelectrolyte at the solid interface is a key for the performance of polyelectrolyte-based fuel cells. We present the impact of interfacial effect on proton conductivity of Nafion in thin films supported on quartz substrates. With decreasing film thickness, the in-plane and out-of-plane proton conductivity increased and decreased, respectively. Neutron reflectivity measurements confirmed that a hydrated multilamellar structure of Nafion was formed near the quartz interface. Finally, we demonstrate the enhanced proton conductivity by increasing the ratio of the interfacial area to the total volume. This finding should provide a new insight into the material design of polyelectrolytes for fuel cells.

Keiji Tanaka
Kyushu University

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