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Nafion/poly(1-vinyl imidazole) composite membranes for fuel cell application DUKJOON KIM, Sungkyunkwan University, SUNGKYUNKWAN UNIVERSITY TEAM — A base monomer (1-vinyl imidazole, VIDz) was polymerized in Nafion[®] 112 membrane by UV irradiation in order to reduce methanol permeability of the latter. With increasing content of poly 1-vinyl imidazole (PVI), equilibrium water uptake was decreased due to reduced size of hydrated ion cluster in the composite membrane as confirmed by a small angle X-ray scattering analysis. The electrochemical properties of the membrane such as ion conductivity, methanol permeability and electro-osmotic drag were also affected by equilibrium water uptake and hydrated pore size. Even a minute incorporation of the base polymer showed a significant effect on proton conductivity and methanol permeability. Methanol transport by electro-osmotic drag was evaluated by using relating equations and methanol permeability and limiting current density data obtained in this study. Although the absolute number of electro-osmotic drag was hard to determine, the trend of change could be studied in relation to bulk-like water in composite membranes. This novel composite membrane exhibited an increased cell performance compared with a plain Nafion membrane due to reduced methanol crossover rate.

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