

## Nanocomposite Membrane of Nafion and Montmorillonites Functionalized with an Organic Sulfonic Acid for Direct Methanol Fuel Cell

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The composite membranes have been mostly prepared by addition of non-conductive ceramic oxide in the Nafion membrane. These composite membranes containing inorganic moieties indeed reduced the methanol crossover. Yet this effect did not always lead to desired improvement in the performance of DMFC because of less proton conductivity of the composite membranes containing inorganic moieties. Thiol and sultone groups were grafted onto the surface of montmorillonite(MMT) to render the organic sulfonic acid ( $\text{HSO}_3^-$ ) functionality. The nanocomposite membranes were casted together with Nafion using these functionalized MMTs as inorganic fillers. The performance of the Nafion /  $\text{HSO}_3^-$ -MMT composite membranes for direct methanol fuel cell (DMFC) was evaluated in terms of methanol permeability, proton conductivity and the cell performance. The nanocomposite membrane reduced the relative permeability of methanol in 5M solution by *ca.* 40%, while maintaining comparable ionic conductivity relative to pristine Nafion membrane.