

## Effect of dispersant in Nafion nanocomposite membranes containing hydrophobic silica for direct methanol fuel cell (DMFC)

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Perfluorinated sulfonic ionomer membranes including Nafion exhibit high proton conductivity and excellent membrane durability. In addition to high production cost, the poor barrier properties to methanol molecules have limited their applications for DMFC. There have been a lot of approaches to reduce methanol permeation through the membranes without any losses in the proton conductivity and membrane resistance. A solution may be the fabrication of Nafion nanocomposite membranes using nano-sized inorganic particles which acts as methanol barrier. It is important to select appropriate inorganic particles for nanocomposite membranes. In this study, hydrophobic silica with the average size of 7 nm was used to reduce excessive water swelling of pristine Nafion and, subsequently, to lead to the reduced methanol permeation properties. Moreover, commercial surfactants were used as dispersants to avoid the heterogeneous distribution of silica nanoparticle within Nafion matrix. Interestingly, hydrophilic functional groups in the surfactants compensated the reduction of proton conductivity derived from the use of hydrophobic silica.