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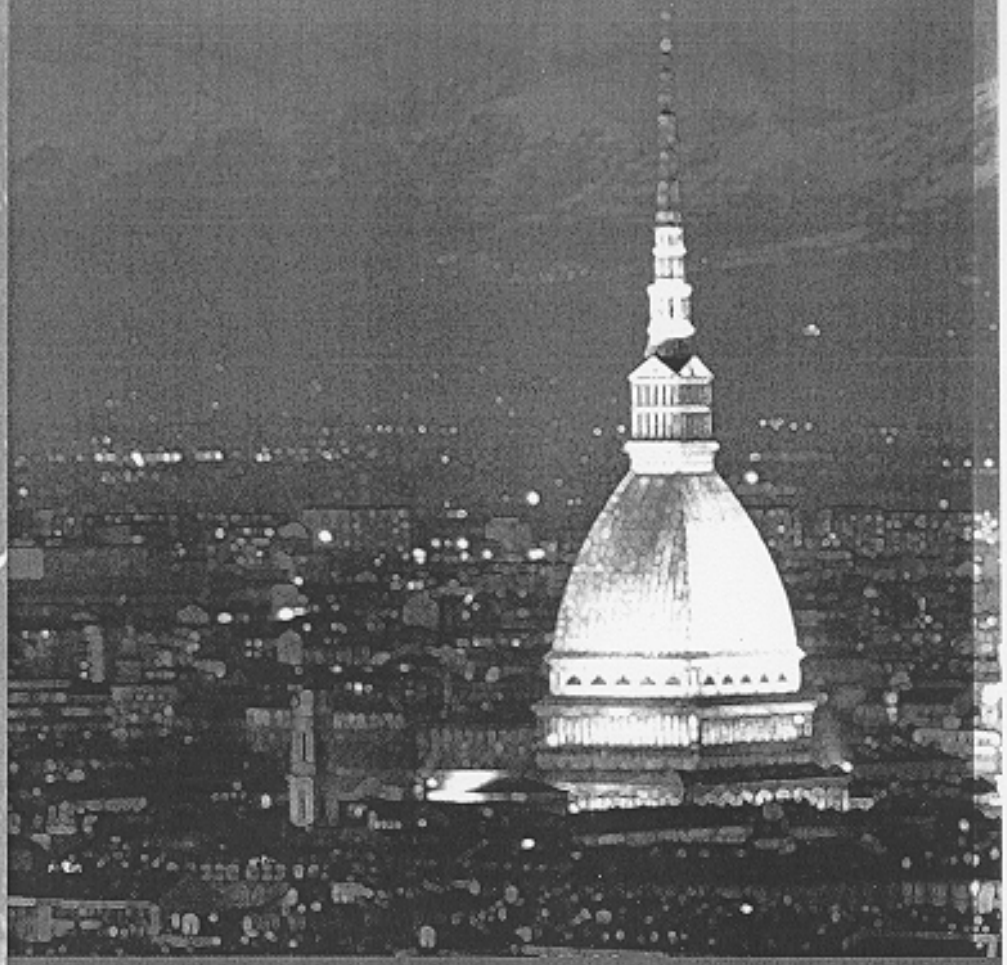

A Grove Fuel Cell Event

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Solution-cast Nafion® composite membrane

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Considered as a promising alternative for future energy needs, fuels cells are expected to play an important role in the replacement of internal combustion engines, since they can provide clean, quiet and portable power. Among the various existing types, proton-exchange membrane fuel cells (PEFCs) and direct methanol fuel cells (DMFCs) are known to make use of proton exchange membranes (PEMs).

Perfluorosulfonate ionomer dispersions in dimethylformamide solvent were used to form solution-cast membranes. Modified composite membranes were prepared with different preparative methods. Measurements of water uptake, solubility and methanol permeation of the cast membranes were conducted. Electrochemical impedance spectroscopy (EIS) was used to evaluate the conductivity of the recast composite membranes. Tangential conductivities were measured directly on membranes fully immersed in deionized water or in air at different relative humidity. Results show that the addition of a low quantity of silicate did not alter the conductivity (94-96 mS cm^{-1} at 25°C), but produced a marked decrease of methanol permeability (-6%). To explain the increase of tangential conductivity with decreasing thickness of Nafion and recast membranes, also a simple model was proposed.

Keywords: membrane, Nafion™, fuel cell, cast method.