Nanocomposites and nanomaterials

Controlled doping of TiO_2 nanostructures. Potential to enhanced hydrophilicity and proton conductivity.

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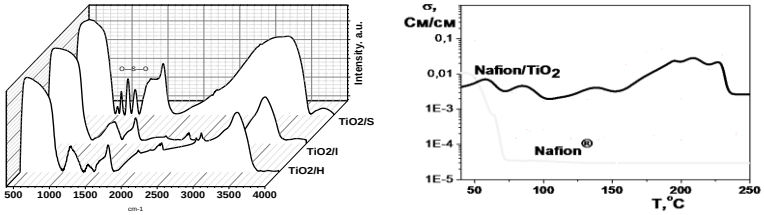
The realization of nanoscale devices based on TiO_2, demands new ways of their modification including controlled doping. Common doping processes often fail to meet the requirements in terms of junction depth and abruptness and 1D-3D doping capability. The hydrophilic TiO_2 nanomaterials can be of significant importance for construction of the effective photocatalysts, enhanced performance of composite proton exchange membrane fuel cell.



FTIR spectra and temperature dependence of proton conductivity of the pristine and composite Nafione membrane

Our intention was to develop an low-cost and highly efficient sol-gel method for modulation doping of TiO2 nanostructures, which can act as an effective hydrophilic additive for proton exchange membrane fuel cell that operated at temperature of above 100°C. We elaborated method of the carefully controlled doping of TiO_2 nanostructures. By the AFM, XPS, SEM, XRD, optical and FTIR spectroscopy investigated the properties of doped materials Preliminary tests of proton conductivity was organize and carry out on the composite membrane based on commercial Nafion material. The test has highlighted the benefit of additives of the doped titania on the conductivity of membrane in the temperature range up to 240°C, that maintained at (10^{-2} -10^{-3} S/cm). The above may be a prerequisite for enhanced hydrophilicity and proton conductivity composite polymer membrane.