

UV-Raman spectroscopic characterizations of thermally processed Nafion and perfluoroalkyl ionomer materials

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Ultraviolet Raman spectroscopy studies were utilized to analyze ionomer membranes cast by a high temperature solution processing method. These materials retain structural integrity following cleaning and ion-exchange steps in boiling solutions, similar to the commercial fuel cell membrane Nafion. Unlike the commercially available film, which typically has thicknesses $> \sim 50 \mu\text{m}$, the structural properties of the sub-micron thickness materials can be probed in mid-infrared and ultraviolet spectral measurements with the use of Fourier transform infrared (FTIR) and Raman spectroscopy. Raman studies using an UV source allow the enhancement of the Raman signal versus a visible Raman source, and these results will be compared to spectra from FTIR. Spectra are discussed for thermally processed Nafion and related perfluoroalkyl ionomer materials containing phosphonate and phosphinate moieties substituted for the sulfonate end group on the side chain.