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# Exploration of anion transport in a composite membrane via experimental and theoretical methods

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## Abstract

The conductivity of polymerized ionic liquid graft copolymers (PILGCs) is usually three orders of magnitude lower than ionic liquids (ILs); researches are being performed actively to improve ion transport in PILGCs. In the research, the composite membrane of poly(1-butyl-3-vinylimidazolium-acetate) (poly([BVIM]-[OAc])) PILGC and NPs filled with 1-butyl-3-methylimidazolium acetate ([BMIM]-[OAc]) IL was developed. Ion transport in the composite is a combination of that in PILGC and IL and mechanisms underlying anion transport in the PILGC and the IL should both be explored in order to obtain profound knowledge of ion transport (mechanism) in the composite. Researchers still have discrepancy in the mechanisms of ion transport in PILGCs. We explored the mechanisms and time scales of ion transport in the PILGC and compared the differences in ion transport phenomena and mechanisms in the PILGC and the IL. 2D-IR experiments were performed and the results show that the peak-shape of the spectra of  $\text{SCN}^-$  in the PILGC changes on a much slower time scale than that in the IL, indicating that the IL completes structure decay in a way significantly faster than the PILGC. Anion

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