Polymer Nanocomposites for Solid State Electrolytes

Gwomei Wu
Chang Gung University, Taiwan

ABSTRACT

We investigated polymer nanocomposites based on poly(vinyl alcohol) and silica (0-9% by weight) for solid state electrolyte applications. The silica is of 20 nm in size and has a high specific area of 640 m2/g. The composite membrane system was then characterized on their mechanical properties, crystal morphology and thermal behavior. The tensile modulus increased by ~100% when 5-9% nanoparticles of silica was introduced. However, the tensile strength showed a maximum value at 3-5% silica content. The heat of fusion analysis by differential scanning calorimetry also revealed a decrease with the incorporation of silica while a minimum was obserbed at 5% silica content, indicating a lowest level of polymer crystallinity. Some samples were further immersed in 35 wt% potassium hydroxide aqueous solution for ionic conductivity study. These solid state composite electrolytes showed significant improvement in ionic conductivity over their unreinforced matrix polymer. We will also try to explain the mechanism for the testing results.