

Proton exchange membrane for SO₂ depolarized electrolyzer from hybrid sulfur process

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As the fuel cell technology has been advanced, the demands for hydrogen are increasing. So it is necessary to develop more efficient methods to produce hydrogen. In thermochemical cycles, all other chemical species in these reactions are recycled resulting in the consumption of only heat and water. Among the thermochemical cycles, Hybrid sulfur cycle has SO₂ depolarized electrolyzer, and it has also proton exchange membrane as fuel cells. Proton exchange membrane of this process is required some properties, and low SO₂ permeability is most important to increase overall efficiency. Nafion® membranes are too expensive to be used in real process, permit penetration of SO₂ gas, and have the high resistance. So it is necessary to find more appropriate membrane for this hybrid sulfur process.

In this work, I measured SO₂ permeability of Nafion® membrane and sPEEK membrane, having rigid structure in it. To measure SO₂ permeability, I used potentiostating method. Diffusion is affected by temperature, so I worked measuring diffusion coefficient at different temperature and plotted Arrhenius plot.