

Nanometric building blocks in composite ionic conductors

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Abstract: Main challenges for ion exchange membranes (IEM) are stability and durability. Various strategies are developed to increase the IEM performances. Among them hybrid organic-inorganic nanomaterials show many interesting features: they have the ability to combine the functionality of organic compounds with the stability of inorganic materials. It is possible to distinguish between class I and II hybrids. Class I hybrids (or composites) are obtained dispersing inorganic components in a polymeric matrix. This approach is applied in many protonic membranes and in the last years also in a few anion exchange membranes. The composites are usually obtained mixing or forming nano building blocks via in situ sol-gel reactions. The results are a stabilization of the polymeric phase and a decrease of the fuel crossover. However, a decrease of the conductivity is mostly observed due to the presence of a second phase. The reduction of the conductivity can be mitigated by the use of conducting fillers: the addition of layered double hydroxides containing ionic liquid to ionomer membranes improves the ionic conductivity at low and high humidity. In this presentation the different methods used to synthesized nanocomposite IEM will be overviewed.