

Synthesis and proton conductivity of heteropolyacids loaded Y-zeolite as solid proton conductors for fuel cell applications
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Abstract

A novel solid proton conducting material has been prepared by loading various weight percentages of heteropolyacids (HPA) onto Y-zeolite. The synthesis conditions have been optimized to ensure complete loading of HPAs onto Y-zeolite structure. The proton conductivity of the prepared material enhanced with the loading of HPAs onto Y-zeolite and strongly affected by the presence of water, reaching to more than 20 times compared to dry conditions. The highest conductivity of the order of 10⁻² S/cm was found at room temperature for fully hydrated solid proton conductors containing 50 wt % HPAs. The prepared materials have been characterized by FT-IR, SEM and X-ray diffraction, which confirm the presence of heteropolyacids into Y-zeolite structure. Leaching study carried out on the powder samples, confirmed that the material leached out through the experiment was negligible and hence almost complete loading of HPAs into the Y-zeolite structures was achieved. The new material combines the high thermal and structural stability of Y-zeolite with outstanding conductivity of HPAs, which places them among one of the most promising solid proton conductors.

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