

Proton conducting composites of heteropolyacids loaded onto MCM-41

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Abstract

Proton conducting composites have been prepared by loading heteropolyacids, namely tungstophosphoric (TPA) acid and molybdophosphoric (MPA) acid, into MCM-41 molecular sieve. The synthesis procedure was optimized to ensure maximum loading of TPA and MPA with negligible leaching of solid acids. The proton conductivity of the composite powdered materials was found to depend on the loading of the heteropolyacids and strongly affected by the presence of water in the solid. The highest proton conductivity of the order of 10^{-2} S cm⁻¹ at room temperature was found for the TPA loaded MCM-41. The prepared materials have been characterized by FTIR, SEM and X-ray diffraction, which confirm the presence of heteropolyacids into MCM-41 molecular sieve structure. Leaching study carried out on the composite solids confirmed that the material leached out through the composite solids was negligible and hence almost complete loading of heteropolyacids into the MCM-41 structures was ensured. The new material combines the high thermal and structural stability of MCM-41 with outstanding conductivity of heteropolyacids. The high conductivity and negligible leaching of this material makes it suitable for use in the preparation of membranes for use in fuel cells and other electrochemical device. © 2005 Elsevier B.V. All rights reserved.

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