New multifunctional sulfonato-containing metal phosphonates proton conductors

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Anchoring of acidic functional groups to organic linkers acting as ligands in metal phosphonates has been demonstrate to be a valid strategy to develop new proton conductor materials, which exhibit tunable properties and are potentially applicable to proton exchange membranes, such as those used in PEMFCs [1,2].

In this work, the structural and proton conductivity properties of several families of divalent and trivalent metal amino-sulfophosphonates are presented. The chosen ligand, $(H_2O_3PCH_2)_2$-N-$(CH_2)_2$-SO_3H, was reacted with the appropriate metal salt using highthrough-put screening and/or microwave-assisted synthesis. Different crystal structures haven been solved displaying a variety of metal ligand coordination modes, in whose frameworks acidic groups contribute to create strong H-bond networks; together with lattice and bound water molecules. Proton conductivity values oscillate between 10^{-4} and 10^{-2} $S{\cdot}cm^{-1}$, at 80 ºC and 95 % relative humidity, most of them showing activation energies characteristic of a Grotthuss-type proton transport mechanism.

References

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