

Using transition metal tetraphosphonates as precursor of phosphorus-containing electrocatalysts

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Coordination polymers (CPs) are widely studied due to their applicability in many fields.[1] Among them, metal phosphonates (MPs) are attractive materials due to their versatile structural diversity and functionality, with interesting properties as proton conductors and electrocatalyst precursors [2,3].

In this work, we report the synthesis and crystal structures of several MPs derived from the combination of *hexamethylenediamine-N,N,N',N'-tetrakis(methylenephosphonic acid)* (HDTMP) with different transition metals ($M^{2+} = \text{Mn, Fe, Co, and Ni}$). The resulting solids, $M[(\text{HO}_3\text{PCH}_2)_2\text{N}(\text{CH}_2)_6\text{N}(\text{CH}_2\text{PO}_3\text{H})_2] \cdot 2\text{H}_2\text{O}$, show pillared-layered structures with capabilities of ammonia adsorption (Co^{2+} and Ni^{2+} derivatives). The ammonia-containing solids are crystalline, with a composition $M[(\text{HO}_3\text{PCH}_2)_2\text{N}(\text{CH}_2)_6\text{N}(\text{CH}_2\text{PO}_3\text{H})_2(\text{H}_2\text{O})_2](\text{NH}_3)_4(\text{H}_2\text{O})_{12}$. The catalytic activities toward Oxygen Evolution Reaction (OER), Oxygen Reduction Reaction (ORR) and Hydrogen Evolution Reaction (HER) of the corresponding (5% H_2 -Ar)-pyrolyzed materials, as well as the crystal structure of non-pyrolyzed precursor solids, will be discussed.

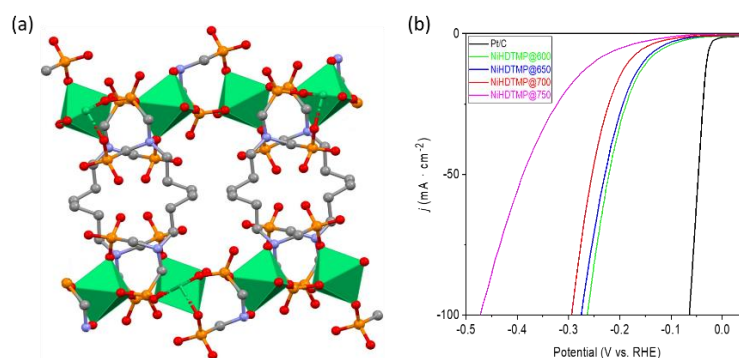


Figure 1. (a) Crystal structure of NiHDTMP and (b) LSV curves of H_2 -pyrolyzed derivatives of NiHDTMP toward HER.

References/Referencias

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