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Imidazole-containing Co^{2+} and Ni^{2+} etidronates: crystal structures and electrochemical behaviour

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Abstract: Metal phosphonates-based coordination polymers (CPs) are known to exhibit versatile structural diversity and functionality [1]. Thus, they have been used, among other applications, as electrocatalyst precursors [2] for both, PEMFCs and electrolysers.

In this work, we report the synthesis, crystal structure and electrochemical properties of imidazole-containing Co^{2+}, Ni^{2+} and Zn^{2+} derivatives of the etidronic acid, $(HO)_2P(O)\text{-}C(CH_3)(OH)\text{-}P(O)(OH)_2$ (ETID). Analyses of the crystal structures reveals that these solids are 1D, in which the imidazole molecules form part of the coordination sphere of the cations (Co^{2+}, Ni^{2+}) or act as charge-compensating imidazolium cations (Zn^{2+}). Co^{2+} and Ni^{2+} solids were pyrolysed under 5% H_2/Ar atmosphere at different temperatures. The resulting metal phosphides were tested as electrocatalysts for the Oxygen Evolution and Reduction Reactions (OER and ORR, respectively) and the Hydrogen Evolution Reaction (HER). Preliminary results indicate that Co^{2+} derivatives exhibit better performance.

Key words: Coordination polymers, phosphonates, imidazole, electrocatalyst, OER, ORR and HER.

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References:

[1] E. R. Engel and J. L. Scott. *Green Chem.* (2020) *22*, 3693.

[2] R. Zhang; S. M. El-Refaei; P. A. Russo and N. Pinna. *J Nanopart Res.* (2018) *20*, 146.