



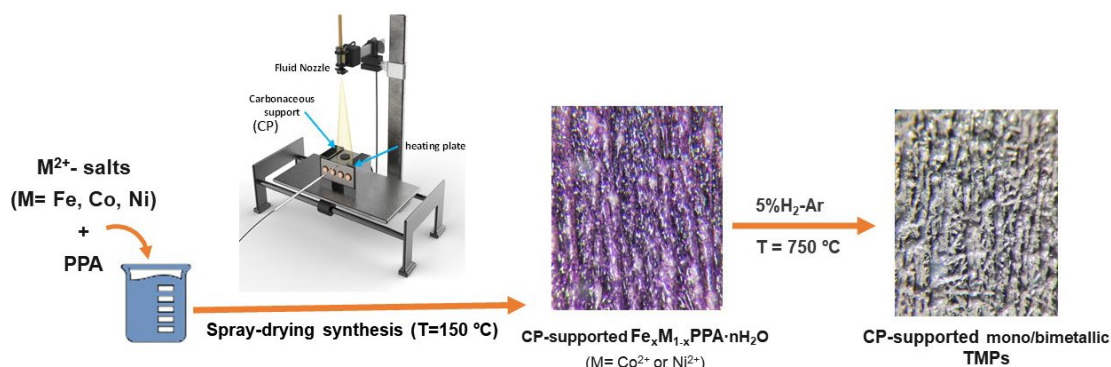
Electrocatalytic properties of spray-drying-synthesized cobalt or nickel phosphonate-derived materials

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As a class of coordination polymers (CPs), metal phosphonates (MPs) are constructed by coordination bonds connecting metal sites and phosphonate (RPO_3^{2-}) ligands, where the metal sites are dispersed uniformly at the atomic level. This feature facilitates the construction of OER/HER transition metal phosphide (TMP) pre-catalysts, making them very attractive precursors of Non-Precious Metal Electrocatalysts (NPMCs) [1, 2]

In this work, we report the synthesis and crystal structures of several transition-metal phosphonates derived from the phosphonopropionic acid (PPA), $[\text{Fe}_x\text{M}_{1-x}(\text{HO}_3\text{PCH}_2\text{CH}_2\text{COO})_2(\text{H}_2\text{O})_2]$; $\text{M}=\text{Co}^{2+}$ or Ni^{2+} ; $x = 0, 0.2$]. These solids have been prepared for the first time by spray-drying synthesis directly on carbon paper (CP) (scheme 1). Pyrolysis of spray-dried materials in 5% H_2/Ar led to TMP-based energy-conversion electrocatalysts. As compared with other conventional procedures, this synthetic methodology allowed to improve the water-splitting activity.



Scheme 1. Synthetic route of the TMP-based energy-conversion electrocatalysts.

References

- [1] Wu, J.; Wang, D.; Wan, S.; Liu, H.; Wang, C.; Wang, X. "An Efficient Cobalt Phosphide Electrocatalyst Derived from Cobalt Phosphonate Complex for All-pH Hydrogen Evolution Reaction and Overall Water Splitting in Alkaline Solution" *Small* **2020**, *16*, 1900550.
- [2] Zhang, R.; El-Rafaei, S.M.; Russo, P.A.; Pinna, N. "Metal phosphonate coordination networks and frameworks as precursors of electrocatalysts for the hydrogen and oxygen evolution reactions" *J. Nanoparticle Res.* **2018**, *20*, 146.