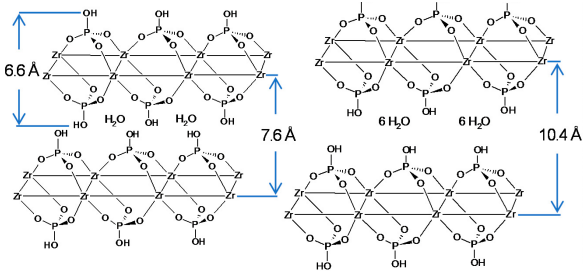
Metal-Modified Zirconium Phosphate Electrocatalysts for the Oxygen Evolution Reaction

M.V. Ramos-Garcés, K. La Luz-Rivera, J.L. Colón

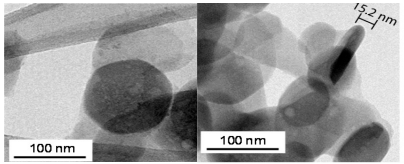
FOCUSING ON THE FUTURE

Introduction

Hydrogen as a fuel has been proposed as a solution to the global energy crisis that we confront. The problem resides in that pure hydrogen is scarce in the atmosphere; it is found mostly in water and other compounds. Hence, schemes for hydrogen production are of much importance in scientific research. For this reason, solar water-splitting devices are being made, but their efficiency are hindered by catalysts that are not very efficient and/or made of precious metals. Most of the efficiency of these devices is limited by overpotential losses of the oxygen evolution reaction (OER). Hence, to improve the performance of these devices, highly active catalysts must be develop. There are different strategies for developing improved catalysts. One proven method is to support active materials onto supports that engender improved performance. In this study we chose to study zirconium phosphate (ZrP) as support for transition metals to create electrocatalityc systems for OER. ZrP is a very robust material, making it suitable for supporting active species at OER's harsh pH and oxidative conditions.

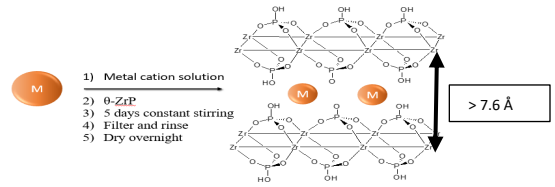


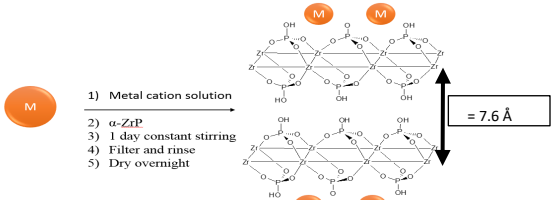
Structures of α-ZrP and θ-ZrP.



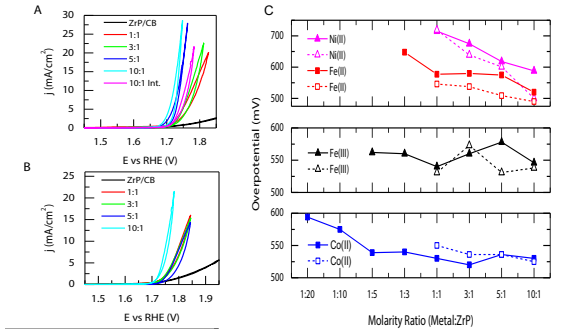
TEM images of α-ZrP.

Previous Work



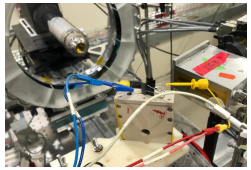


Visual representation of the previously synthetized metal-ZrP systems.



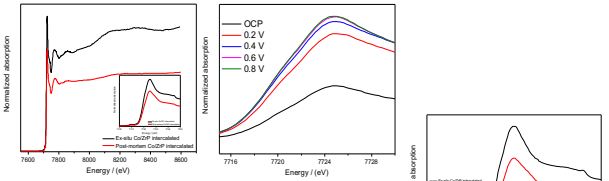
Sanchez, J. *et.al. Catalysts,* **2017,** 132.

CHESS Experiments

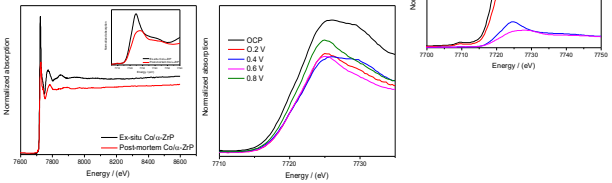


Three electrode electrochemical cell used for in-situ measurements.

Intercalated Co/ZrP



Co/α-ZrP



Conclusions

- XAS measurements for Co/ZrP intercalated and adsorbed samples show insights into the mechanisms of failure of these catalysts.
- These preliminary results show that surface adsorbed Co species are not stable at OER conditions and are partially lost in operando
- The tendency of edge energies to lower values in the intercalated catalyst is indicative that the Co species in the interlayer may not be electrochemically active, partially explaining why adsorbed samples are more active