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Nanostructured electrocatalysts for energy conversion and environmental applications

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Nowadays, the excessive dependence on fossil energy and the continuous environmental deterioration make people realize that it is meaningful to solve these problems by electrochemical method. In this presentation, three projects aimed at providing solutions to energy and environmental issues using electrocatalytic materials will be discussed.

1. To obtain the long-term stability of low-cost electrocatalysts for water splitting, we developed a facile solvothermal method to prepare CoMoO_4 nanosheets for hydrogen evolution reaction. Then, the three-dimensional hierarchical electrode of $\text{Co}_3\text{O}_4/\text{CoMoO}_4$ was designed by stepwise solvothermal method with more excellent electrocatalytic performances. The synergistic effect generated by the composite electrode was also studied.

2. A novel Sb-doped SnO_2 electrode with copper nanorods was prepared and characterized. In this part, we explored the role and the effect of copper nanorods interlayer by electrodeposition process, which revealed the promising prospects of metallic nanorods interlayer for the electrocatalytic wastewater treatment field.

3. The last project explored the activation mechanism of cyclic voltammetry for electrocatalytic water splitting. Experiment results indicated that the phase transition of the Ni/NF electrode promoted the enhancement of HER activities after multi-loop cyclic voltammetry effectively.

References:

- [1] Zhihao Pei, Li Xu, and Wei Xu. Hierarchical honeycomb-like Co_3O_4 pores coating on CoMoO_4 nanosheets as bifunctional efficient electrocatalysts for overall water splitting. *Applied Surface Science* 433 (2018): 256-263.
- [2] Li Xu, liangliang Cao, Wei Xu and Zhihao Pei. One-step electrosynthesis of NiFe-NF electrodes for highly efficient overall water splitting. *Applied Surface Science*, 503 (2020): 144122.



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Born in 1994 in Liaoning Province, China, Zhihao Pei received both his Bachelor's and Master's degree in Chemical Engineering from Tianjin University in 2015 and 2018, respectively. During that period, he focused on synthesis and characterization of electrochemical and electrocatalytic nano-structured materials. He then went on to a research institute as a battery research and development engineer. There, his work involved the research on electrochemical and mechanical behavior of battery materials.