Title

A review on metallic carbides/phosphides embedded in N-doped porous carbon as highly efficiency electrocatalyst for hydrogen evolution reactions in alkaline medium

Abstract

The designing of electrocatalyst to perform hydrogen evolution reaction (HER) in alkaline medium is presently a demanding pathway for sustainable production of hydrogen (H2) which can be generated from alkaline water electrolysis used in industries. Although a large number of electrocatalyst reported in literature have the tendency to exhibit superior HER performance in acidic medium, but the vaporization of acid electrolyte causes corrosion of the cell and resulted in contamination during the H2 production. The involvement of additional step during water dissociation process (volmer step) in alkaline medium could cause serious sluggish electrode kinetics and thus a hunt of new type of heterostructured electrocatalyst (to indue strong synergetic effect of the heterointerfaces) to outperform noble precious metals are under exploration. The development of earth abundant transition metal carbides/phosphides have been emerging recently because of their electronic structure/configuration are similar to that of platinum (Pt), leading to enhance the elecrocatalytic performance. A variety of metallic carbides/phosphides incorporated on porous materials are studied by researchers are faced difficulty in integration of single nanostructure unit to achieve HER activity in alkaline medium as same as that in acidic medium. The present review aims to provide comprehensive of heterostructured carbides/phosphides supported on N-doped porous carbon (NPC) for electrocatalytic efficiency for HER. We also discussed the influencing role of structure, codopants, and the porosity for lowering overpotentials. Finally, the challenges and the future goals for designing efficient electrocatalyst to provide promising HER for large scale applications are highlighted.

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