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Gas-solid phase growth of hierarchical nanoporous nanoplates for water splitting in acidic conditions

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Abstract

Electrochemical production of H_2 is hindered by the high cost of noble metal catalysts. Herein, a novel hierarchical nanoporous β-Mo_2C nanoplate was fabricated by a chemical vapor deposition (CVD)-based gas-solid growth strategy for the first time. The parallelogram (or hexagon)-like structure grows directly on conductive substrates and shows uniform nanoporous ligament-pore texture with a pore size of ~20-40 nm. When evaluated as a binder-free electrode for hydrogen evolution reaction (HER), the hierarchical β-Mo_2C nanoplates exhibit an excellent electrocatalytic performance for HER with a small overpotential of ~80 mV, a small Tafel slope of 68 mV decade^{-1} and remarkable stability.

Keywords: Hierarchical structure; Nanoporous; Mo_2C; Water splitting

1. Introduction