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Confining nano-sized Pt in nitrogen doped ordered mesoporous carbon: an effective approach toward efficient and robust hydrogen evolution electrocatalyst

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Abstract: Despite recent progress in the development of earth abundant electrochemical catalyst for hydrogen evolution reaction (HER), Pt based materials still stand as the state of the art HER catalyst. Due to the high cost of Pt, it is desirable to increase the utilization efficiency of Pt in practical HER process to a realize cost effective hydrogen production. Herein, we report a novel nitrogen doped ordered mesoporous carbon supported Pt (Pt@NOMC-A) catalyst with a low Pt loading of 7.2 wt% and show that the synergy between Pt nanoparticles and carbon support, as well as the physical confinement offered by the carbon support enhance the electrochemical performance of the novel catalyst. Pt@NOMC-A exhibits a low HER overpotential comparable with commercial 20 wt% Pt/C catalyst under acidic, neutral and alkaline condition. Furthermore, Pt@NOMC-A shows a superior electrochemical stability under working conditions suppressing that of commercial Pt/C catalyst.

Keywords: ordered mesoporous carbon, nitrogen doped, hydrogen evolution reaction, Pt catalyst

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