

## Graphene-dot Wrapped PtMo Nanosponge as a Highly Efficient Electrocatalyst for Hydrogen Evolution Reactions in both Acidic and Alkaline Media

Nguyen Van Toan, Ngoc-Anh Nguyen, 최호석<sup>†</sup>  
충남대학교  
(hchoi@cnu.ac.kr<sup>†</sup>)

A three-dimensional PtMo nanosponge wrapped with ultra-thin layers of graphene dots (denoted as 3D Pt<sub>x</sub>Mo<sub>1-x</sub>@graphene) has been developed for catalysis of the hydrogen evolution reaction (HER). The graphene-dot wrapping carries out by exfoliating carbon dots during the co-reduction of Pt and Mo precursors at a low temperature in an aqueous solution. The outstanding HER performance and superb durability, in both acidic and alkaline electrolytes, are attributed to the synergistic effects of inner metallic alloy networks and outer graphene dots in the 3D Pt<sub>x</sub>Mo<sub>1-x</sub>@graphene. The 3D Pt<sub>x</sub>Mo<sub>1-x</sub>@graphene reveals a low Tafel slope together with a low overpotential to produce a current density of -10 mA cm<sup>-2</sup> in acidic media. Especially, the 3D Pt<sub>x</sub>Mo<sub>1-x</sub>@graphene catalyst overcomes a large amount of repeated potential cycling exceeding 5000 cycles in acidic solution and long-term durability of over 50,000 seconds in an alkaline solution.