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Cobalt Phosphosulfide Decorated Reduced Graphene Oxide Aerogel for Water Electrolysis

Clean and sustainable energy carrier is highly required along with the growing concerns for global warming. Hydrogen is one of the promising candidates for next-generation energy carrier without harmful by-product as well as high energy conversion efficiency.[1] Water electrolysis, which is typical method for hydrogen production without harmful by-product, minimizing energy loss is the critical problem for the real-world application.[2] To date, Platinum (Pt) has been known to be the most efficient catalyst toward hydrogen evolution reaction (HER) along with its low overpotential. However, high cost due to its rarity is the challenge for Pt-based electrocatalysts.[3] In this work, we develop facile method to fabricate cobalt phosphosulfide (CoS|P) decorated reduced graphene oxide (rGO) aerogel for water electrolysis. Dispersibility of graphene oxide (GO) and cobalt acetate (CoAc) in aqueous solution enables a simple route to an ideal structure with efficient charge transfer and maximized catalytic surfaces. CoS|P/rGO shows excellent catalytic activity toward HER in acidic media with moderate stability. Also, study for our synthetic method shows a possibility to be applicable to various fields that requires small, uniform nanoparticle decorated hybrid structures.

References

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[2] I. Dincer, C. Acar, Int. J. Hydrogen Energy, 40 (2015) 11094
[3] M. S. Faber, S. Jin, Energy & Environmental Science, 7 (2014) 3519

Figures

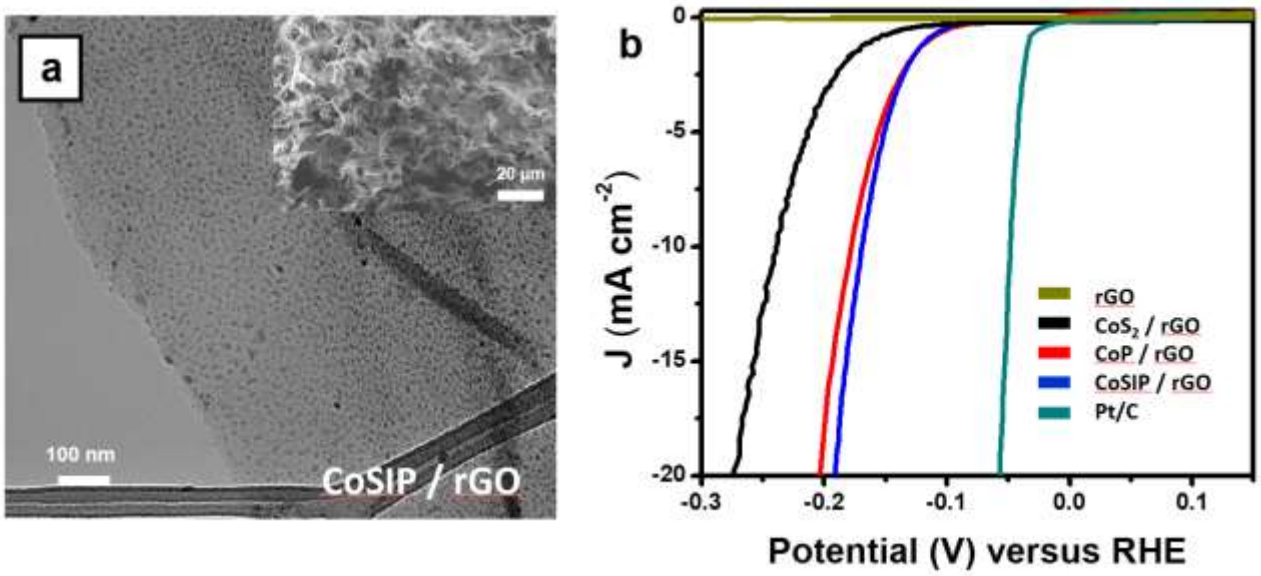

Figure 1: (a) SEM (inset in b,c,d), Low magnification TEM images of CoS|P/rGO aerogel. (b) Linear sweep voltammetric curves in 0.5 M H_2SO_4 solution with rGO, CoS_2/rGO aerogel, CoP/rGO aerogel, CoS|P/rGO aerogel, and Pt / C.