

UniSysCat - Colloquium

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Start Time: Wednesday, July 27, 2022 05:00 pm

End Time: Wednesday, July 27, 2022 06:00 pm

Conversion of industrial waste H₂S pollutant to value-added products

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Highly efficient and cost-effective hydrogen production (H₂) promises to play a vital role in green energy production due to its high energy density, low-pollution, and renewable nature. The electrocatalytic decomposition of H₂O to H₂ and O₂ considered to be the most sustainable method for pure H₂ production, unfortunately, it stumbles due to potentially uphill and energy-consuming sluggish anodic oxygen evolution reaction (OER).¹ Contrary to H₂O isostructural hydrogen sulfide (H₂S) possesses lower bond dissociation energy. Therefore, anodic sulfide oxidation reaction (SOR) will be more energy-efficient than OER. Presently, the Claus process is the most popular industrial technology for removing H₂S, but energy wasted in the form of steam. Therefore, electrochemical conversion of environment pollutant H₂S into H₂ and S provide a way to remove pollutant H₂S and also emerges as new energy source.² However, the industrialization of such energy-efficient technology never meets the expectation in reality in the absence of cost-effective and robust electrocatalyst. Herein we have designed CoFeS₂ based catalyst that exhibited lower onset potential of 0.23 V vs. RHE towards SOR, which is 1.25 V lower than OER. Notably, only a 1.2 V commercial battery easily derives H₂S electrolysis, which is impossible for H₂O splitting demonstrating the tremendous future prospective of H₂S for cheaper hydrogen production for a sustainable economy.

References:

1. Zhang, M.; Guan, J.; Tu, Y.; Chen, S.; Wang, Y.; Wang, S.; Yu, L.; Ma, C.; Deng, D.; Bao, X., Highly efficient H₂ production from H₂S via a robust graphene-encapsulated metal catalyst. *Energy Environ. Sci.* 2020, 13 (1), 119-126.
2. Kumar, M.; Tharamani, C. Nagaiah, *Journal of Materials Chemistry A*, 2022, 10, 7048 - 7057

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