# 硫化氢高效还原氧化石墨烯及高性能锂硫电池构建

张辰[1]，吕伟[2]，杨全红[1,2*]

[1]天津大学化工学院，天津, 300072

[2]清华大学深圳研究生院炭功能材料工程实验室，深圳，518055

*Email: qhyangcn@tju.edu.cn

硫化氢是含硫量最高的化合物（质量分数达94%），对硫化氢的高效回收、变废为宝一直以来都是产业界和科学界关注的焦点。氧化石墨烯作为石墨烯的重要衍生物，其大的比表面积和丰富的含氧官能团赋予其优异的化学相容性和可操作性。本文从材料的表面化学出发，将硫化氢作为新型还原剂和理想的硫源，利用硫化氢和氧化石墨烯之间快速的氧化还原反应，有效去除了高浓度硫化氢并得到了石墨烯/硫复合材料[1]。氧化石墨烯表面含氧官能团得到了有效脱除，同时单质硫均匀沉积在石墨烯表面。所得石墨烯/硫复合材料作为锂硫电池电极材料，表现出良好的性能。石墨烯导电网络的构建和丰富的孔隙结构，能够有效提高对多硫化物的限域作用，提高硫的利用率和电池的循环稳定性，离子和电子快速传输通道的搭建，进一步提高了电池的倍率性能。该方法同步实现硫化氢的高效脱除和氧化石墨烯的还原，为硫化氢的循环再利用提供了可行方案，实现了环境保护与新能源的有机结合。

关键词：硫化氢；氧化石墨烯；锂硫电池

## 参考文献

[1] Zhang, C.; Lv, W.; Zhang, W. G.; Zheng, X. Y.; Wu, M. B.; Wei, W.; Tao, Y.; Li, Z. J.; Yang, Q. H. *Adv. Energy. Mater.* **2014**, **4**: 1301565.

# Reduction of graphene oxide by $H_2S$ and its application in Li-S battery

**Chen Zhang[1], W Lv[2], Q.-H. Yang[1,2*]**

**[1] School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072**

**[2] Engineering Laboratory for Functionalized Carbon Materials, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055**

Hydrogen sulfide is a kind of toxic gas with the highest sulfur content as a molecule (94 wt%), motivating us to explore novel strategy for its effective elimination and recycle. Graphene oxide (GO) with high surface and abundant functional groups, is an important derivate of graphene to broaden its applications. Inspired by the surface chemistry of GO and $H_2S$, we developed $H_2S$ as a novel and effective reducing agent for the reduction of graphene oxide, and a graphene/S hybrid can be prepared in the reduction process simultaneously. The resulting graphene/S is highlighted as a promising cathode of Li-S battery, exhibiting high power performance and good cyclic stability. The elimination of $H_2S$, the effective reduction of GO and the construction of high performance electrode material for Li-S battery are realized in one process. This strategy provides us an appealing route for the combination of pollutant control and energy storage.