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Sulfur-doped cobalt oxide nanowires as efficient electrocatalysts for iodine reduction reaction

Wentao Liang, Kaicai Fan, Yemei Luan, Zhijin Tan, Mohammad Al-Mamun, Yun Wang, Porun Liu, Huijun Zhao



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1 **Sulfur-doped Cobalt Oxide Nanowires as Efficient Electrocatalysts for Iodine**  
2 **Reduction Reaction**

3 Wentao Liang<sup>a, †</sup>, Kaicai Fan<sup>a, †</sup>, Yemei Luan<sup>a, b</sup>, Zhijin Tan<sup>a</sup>, Mohammad Al-Mamun<sup>a</sup>, Yun  
4 Wang<sup>a</sup>, Porun Liu<sup>a, \*</sup>, Huijun Zhao<sup>a, \*</sup>

5 <sup>a</sup> Centre for Clean Environment and Energy, School of Environment and Science, Griffith  
6 University, Gold Coast Campus, Queensland, 4222, Australia

7 <sup>b</sup> College of Textile and Garment, Hebei University of Science and Technology, Shijiazhuang  
8 050018, P. R. China

9 \*Email: [h.zhao@griffith.edu.au](mailto:h.zhao@griffith.edu.au), [p.liu@griffith.edu.au](mailto:p.liu@griffith.edu.au), Tel: (+61)-7-55528261

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11 **Abstract:** Sulfur-doped cobalt oxide (S-Co<sub>3</sub>O<sub>4</sub>) crystals exhibit excellent catalytic activities  
12 towards multiple useful reactions, however, the impact of the structural properties on the  
13 resultant catalytic activities has been overlooked in the past. We demonstrate a facile vapor-  
14 phase hydrothermal (VPH) doping approach to effectively create electrocatalytically active  
15 surface sulfur species on the chemical bath deposited polycrystalline Co<sub>3</sub>O<sub>4</sub> nanowires for  
16 iodine reduction reaction (IRR). The dye-sensitized solar cells (DSSCs) equipped with the S-  
17 Co<sub>3</sub>O<sub>4</sub> nanowire film as the counter electrode (CE) achieve a best energy conversion  
18 efficiency of 6.78%, which is comparable to those of DSSCs with commercial Pt CE (7.36%).  
19 The impact of film structure, VPH temperature and VPH duration on the resultant structures  
20 as well as the electrocatalytic activities has been comprehensively studied. More importantly,  
21 our results manifest a close correlation between the surface sulfur dopant level and the key  
22 electrocatalytic activity indicators. The VPH approach could be further extended to the  
23 fabrication of low-cost, high-performance nanomaterials for energy conversion applications.

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