Porous Ir-Sn Binary Oxide Nanorod Assembly as an Efficient Electrocatalyst for Water Oxidation

Wangting Lu¹, Peng Yuan², Feng Wei¹, Kun Cheng¹, Wenhui Li¹, Youhua Zhou¹,
Wanquan Zheng¹, Geng Zhang^{2,*}

¹ Institute for Interdisciplinary Research, Jiangnan University, 430056, Wuhan, P. R. China.

² Department of Chemistry, College of Science, Huazhong Agricultural University, 430070, Wuhan, P. R. China.

*E-mail: zhanggeng@mail.hzau.edu.cn

doi: 10.20964/2018.04.19

Received: 4 November 2017 / Accepted: 15 January 2018 / Published: 6 March 2018

The large-scale deployment of proton exchange membrane water electrolysis technologies is hindered by the usage of high-cost and scarce noble metal oxides as catalysts for the oxygen evolution reaction (OER) at an anode. Herein, we provided a facile method to synthesize Ir-Sn binary oxides in the form of a nanorod assembly with a large number of pores and a lower Ir content as efficient catalysts for the OER. The deep eutectic solvent formed by glucose and urea plays a crucial role in the synthesis. When heating the deep eutectic solution containing IrCl₃ and SnCl₂ at 180°C, the polymerization and the following expansion of glucose produces a bread-like porous foam with embedded Ir and Sn metal ions. During the following calcination process in Ar and air, the sintering of the catalyst is inhibited owing to the blocking effect of the glucose-derived carbonaceous material, and the removal of the carbonaceous species produces pores in the final product. The –NH₂ groups in urea can form complexes with the Ir and Sn metal ions, which is beneficial to obtain the formation of an Ir-Sn binary oxide with uniform composition. As a result, an Ir-Sn oxide with an Ir/Sn molar ratio at 2/1 presents the best catalytic activity for the OER among the Ir-Sn oxides, which is almost identical to that of a mono-Ir oxide. The method in this work provided a pathway to fabricate high-performance OER catalysts with low Ir content.

Keywords: Oxygen evolution reaction, Deep eutectic solvent, Iridium, Tin, Porous

[FULL TEXT](#)

© 2018 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).