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Research on the influence of the free carbon on the catalytic performance of tungsten carbide

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Nanostructured tungsten carbide (WC) with a high surface area and containing free carbon is synthesized via a low-temperature combustion synthesis method, which is used as the catalyst for a gas diffusion electrode. The different carbon content of WC is characterized by X-ray diffraction (XRD), field-emission scanning electron microscopy (FESEM), brunauer-emmett-teller (BET) and X-ray photoelectron spectroscopy (XPS). When the mole ratio of C/W is 16.5/3, with the increase of temperature, the content of free carbon also increase gradually by BET method. The changes of carbon content as the carbonization temperature are proved by XPS. The synthesis of WC often leads to excess surface carbon that can greatly affect its electrocatalytic activity. By the test of polarization curves and electrochemical impedance spectroscopy (EIS), it is demonstrated that the WC will possess the highest electrochemical performance when the carbonization temperature is 1100°C. This study shows that the appropriate free carbon content is very important in order to get excellent catalytic properties of WC.

Biography

Zhiwei Liu received his MS in 2012 from University of Science and Technology Beijing, and studied on the preparation of high density iron-based power metallurgy materials. He began the doctoral studies at the same university after graduation, and then joined Prof. Li's group as a doctoral researcher in institute of powder metallurgy, Institute for Advanced Materials and Technology. Since March 2013, his current research focuses on the catalytic performance study of the preparation of tungsten carbide by low temperature combustion synthesis. Meanwhile, he works on fuel cell and the oxygen electrode catalyst of lithium-air battery.

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