

材料化学工程与纳米技术

Pt/WC催化剂的制备及其在气体扩散电极上的氧还原性能

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收稿日期 2008-11-18 修回日期 2009-4-8 网络版发布日期 2009-10-16 接受日期

摘要

以喷雾干燥处理的偏钨酸铵为前驱体, 采用CO/CO₂为还原碳化气氛, 利用程序升温气固反应法制备了分散性良好的空心球状WC粉体, 并分别以WC和Vulcan XC-72R碳粉为载体, 采用液相沉积还原法制备了Pt/WC及Pt/C催化剂。XRD和SEM测试结果表明, 所制备催化剂中Pt/WC的Pt粒子粒径要大于Pt/C。酸性条件下氧电极极化曲线测试结果表明, Pt/WC的氧还原催化性能要优于Pt/C, 这主要表现在同一电位下较高的电流密度及还原起始电位正移约28 mV。讨论了Pt/WC催化性能提高的可能原因及催化机理, 并对控制条件下Pt/WC氧气扩散电极的交流阻抗谱进行了研究。

关键词

[碳化钨](#) [Pt/WC](#) [氧气扩散电极](#) [氧还原](#) [交流阻抗](#)

分类号

Preparation and characterization of Pt/WC catalyst for oxygen reduction at gas-diffusion electrode

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Abstract

By using spray-drying treated ammonium metatungstate (AMT) as precursor, the hollow globular tungsten carbide (WC) catalysts were prepared by sphere miniaturation-gas-solid reaction, and then the catalysts Pt/WC and Pt/C were prepared by reduction of platinum salts with HCHO in H₂O solvent. The size of Pt metal particles in both catalysts was characterized by XRD and SEM, and the results indicated that Pt metal particles were 10.6 nm in Pt/WC while they were 2.8 nm in Pt/C. The measured polarisation curves of oxygen reduction reaction (ORR) in the gas diffusion electrode showed that Pt/WC oxygen-diffusion electrode exhibited a better electro-catalytic properties than Pt/C in acid solution, as shown by the higher current density at the same potential and initial potential of oxygen reduction positive. Then the possible reason and electro-catalytic mechanism were discussed, and the AC impedance spectra of gas diffusion electrode with Pt/WC under the controlled conditions were also studied.

Key words

[tungsten carbide](#) [Pt/WC](#) [oxygen-diffusion electrode](#) [oxygen reduction](#) [AC impedance](#)

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