

## PEMFC催化剂的研究: 自制抗CO中毒Pt-Ru/C电催化剂的性质

李莉,王恒秀,徐柏庆,李晋鲁,陆天虹,毛宗强

清华大学;中国科学院长春应用化学研究所;清华大学核能技术设计研究院

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**摘要** 用胶体法制备了抗CO中毒PEMFC阳极Pt-Ru/C电催化剂(标记为THYT-2),对比研究了THYT-2与Johnson Matthey (JM)公司同类品牌Pt-Ru/C催化剂的电化学及其它物理化学性能。结果表明, THYT-2电催化剂在甲醇燃料电池和CO/H<sub>2</sub>( $\Phi_{\text{CO}} = 1 \times 10^{-4}$ )

的氢氧燃料电池中的电催化行为与JM催化剂相当,但THYT-2

在低浓度CO氢气燃料中的电池性能更好。两种催化剂的其它物理化学性质具有类

似性: XPS分析结果表明THYT-2和JM催化剂中都有三种不同价态的Pt存在:即金属态Pt(0)、氧化态Pt(II)和Pt(IV)。HRTEM测试结果表明两种催化剂的粒径处在2~3 nm左右,

这可能是它们拥有良好电化学性能的主要原因之一。本文还对催化剂

中Pt与Ru组分的分布和相互作用进行了讨论,提出了改进Pt-Ru/C电催化剂的思路。

**关键词** [燃料电池](#) [铂](#) [钌](#) [碳](#) [甲醇](#) [X射线光电子谱法](#) [一氧化碳](#)

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## Study of Pemfc Electro-Catalysts: Characteristics of a Homemade CO- Tolerant Pt-Ru/C Catalyst

Li Li, Wang Hengxiu, Xu Boqing, Li Jinlu, Lu Tianhong, Mao Zongqiang

State Key Lab of Cl Chemistry, and Technology, Department of Chemistry, Tsinghua University; Changchun Institute of Applied Chemistry, Chinese Academy of Sciences; Institute of Nuclear Energy Technology, Tsinghua University

**Abstract** A homemade Pt-Ru/C catalyst (named THYT-2) was characterized and used as CO-tolerant electrocatalyst for the proton-exchange membrane fuel cell (PEMFC). While THYT-2 showed comparable electrocatalytic activity with that of the commercial Pt-Ru/C catalyst (Johnson Matthey Corporation) by the single-cell performance with CO/H<sub>2</sub>( $\Phi_{\text{CO}} = 1 \times 10^{-4}$ ) or methanol as the fuel, higher resistance toward CO-poisoning was demonstrated when the CO-concentration in the hydrogen fuel was reduced to  $1 \times 10^{-5}$ . The electrochemical oxidation of CO on THYT-2 and the Johnson Matthey Pt-Ru/C catalysts was also indistinguishable by the results of CO-stripping experiment. XRD and XPS measurements show that 60% of the platinum in both catalysts existed in the metallic state of Pt(0) and the other 40% in oxidized Pt(II) and Pt(IV) states. High-resolution TEM detection demonstrates uniformly dispersed Pt-Ru crystals with sizes of 2-3 nm of both catalysts, but selected area EDX analysis reveals non-uniform distribution of ruthenium in the Pt-Ru nano-crystals, which suggest that further improvement of the electrocatalyst can be made with deliberate control of the distribution and interaction of the two metal components.

**Key words** [FUEL CELLS](#) [PLATINUM](#) [RUTHENIUM](#) [CARBON](#) [METHANOL](#) [XPS](#) [CO](#)

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