



碳载体预处理对CoTMPP/BP电催化剂氧还原性能的影响

Effect of Pretreatment of Carbon Supports on Activity of CoTMPP Electrochemical Catalysts for the Reduction of Oxygen

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英文关键词: [CoTMPP/BP electrochemical catalysts](#) [chemical pretreatment](#) [carbon supports](#) [oxygen reduction reaction](#)

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中文摘要:

采用微波加热合成法制备了CoTMPP/BP电催化氧还原催化剂。采用旋转圆盘电极(RDE)研究了BP2000碳载体经30% H₂O₂或6 mol·L⁻¹ HNO₃化学预处理后对催化剂氧还原催化活性的影响,并且在PEM燃料电池工作站上测试了不同CoTMPP/BP催化剂的燃料电池单电池性能。结果表明,碳载体经过化学预处理后催化剂性能有显著提高,并且30% H₂O₂处理效果更好。采用IR、XRD和XPS进一步分析了载体化学预处理对催化剂活性影响的机理:IR结果表明预处理后载体表面羟基(-OH)等含氧基团增多;XRD分析表明900℃热处理后催化剂中有Co₃C(101)和金属态Co(111)结构出现;XPS分析表明碳载体预处理后N原子表面浓度以及组分N1和Co^{III}相对比例升高,有利于Co-N 4-C活性位的形成,然而组分N1, O1s Co^{III}和Co^{II}的结合能(BE)有所下降。

英文摘要:

Cobalt Tetramethoxy-phenylporphyrin (CoTMPP) supported on BP was prepared by microwave synthesis. The influence of chemical pretreatment of carbon supports by 6 mol·L⁻¹ HNO₃ or 30wt% H₂O₂ on the activity of electrocatalysts for oxygen reduction in acid medium has been investigated by the rotating disc electrode technique, and the fuel cell performance of single cells with the different CoTMPP/BP electrocatalysts was examined under actual PEM fuel cell conditions. It was shown that after chemical pretreatments of carbon support, the oxygen reduction activity of CoTMPP/BP was improved significantly, furthermore, pretreatment with 30% H₂O₂ showed advantages compared to 6 mol·L⁻¹ HNO₃. The mechanism of the influence of pretreatment of BP on the catalytic activity of catalysts was studied by IR, XRD and XPS: IR analysis shows surface groups like hydroxyl groups (-OH) produced on carbon surface. The formation of Co₃C(101) and metallic states Co(111) in the catalysts is confirmed by XRD analysis. XPS analysis reveals that both the surface concentration of N and the relative proportion of component N1 and Co^{III} are increased, while the BE of component N1, O1s Co^{III} and Co^{II} are decreased.

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