Short Communication

Effect of trifluoromethanesulfonic acid on the ORR activity of Pt in acid medium

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In this paper, to study the effect of sulfonic groups on the ORR activity of Pt and exclude the effect of polytetrafluoroethylene (PTFE) backbone of Nafion, trifluoromethanesulfonic acid (CF₃SO₃H) was used to simulate the SO₃H-terminated side chains of Nafion. By using the CO displacement technique, it was predetermined that much more sulfonic groups are absorbed on the Pt surface in 50 mM CF₃SO₃H solution compared with that of 0 mM and 1 mM. The influence of sulfonic groups on the oxygen reduction reaction (ORR) activity of Pt is analyzed by using rotating Pt disk electrode (RDE) as work electrode in 0.1 M HClO₄ with various CF₃SO₃H contents. It is found that when the content of CF₃SO₃H is over 5 mM, the electrochemical active area of Pt decreases with increasing the content of CF₃SO₃H in solution, and the oxidation peak of Pt shifts to a higher potential. Meanwhile, the kinetic current loss of Pt increases apparently along with the increase of CF₃SO₃H content which is 40% for 10 mM and 71.3% for 50 mM at 0.9 V, respectively. The result shows that excess sulfonic groups of Nafion adsorbed on the surface of Pt will greatly lower the ORR activity of Pt.

Keywords: Sulfonic groups, kinetic current loss, Nafion, Oxygen Reduction Reaction

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