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Short Communication

Nitrogen-doped carbon supported platinum catalyst via direct soft nitriding for high-performance polymer electrolyte membrane fuel cell



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ABSTRACT

Control of doping levels of nitrogen to carbon support plays a key role to enhance the catalytic activity of the Pt/C catalyst toward oxygen reduction reaction. Mass-production of such materials is still challenging issue for the practical use. Here, we demonstrate a facile approach for fabrication of the nitrogen-doped Pt/C catalysts via direct soft nitriding of the Pt/C catalyst. The commercial 40 wt% Pt/C is first physically mixed with urea and then heat-treated at 300 °C, which allowed a massive production of the 6.6 atom% nitrogen-doped Pt/C catalysts without sacrificing the Pt catalysts. The specific activity increases by 46.9% after the thermal treatment, while the particle size and crystallinity of Pt remain similar to those before the thermal treatment. As a result, the fuel cell test showed a notable increase in the current density by 100% and 18.5% at 0.8 V and 0.5 V, respectively, for the membrane electrode assembly employing urea treated Pt/C catalyst. Hence, the soft nitriding by urea offers great promise as a simple, energy-efficient and eco-friendly way in manufacturing the nitrogen-doped Pt/C catalyst for the polymer electrolyte membrane fuel cell applications.

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