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Short Communication

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

Dong-Jun Seo [a,b,1], *Myeong-Ri Kim* [a,b,1], *Seung Yong Yang* [a,b], *Won-Young Choi* [a,c], *Hyunguk Choi* [a,c], *Seo-Won Choi* [a,c], *Myeong-Hwa Lee* [a,c], *Young-Gi Yoon* [a], *Min-Ho Seo* [a], *Hansung Kim* [b,***], *Chi-Young Jung* [a,**], *Tae-Young Kim* [a,*]

[a] *Buan Fuel Cell Center, Korea Institute of Energy Research (KIER), Jeollabuk-do, 56332, Republic of Korea*
[b] *Department of Chemical and Biomolecular Engineering, Yonsei University, Seoul, 03772, Republic of Korea*
[c] *Department of Energy Storage and Conversion Engineering, Chonbuk National University, Jellabuk-do, 54596, Republic of Korea*

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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.

* *Corresponding author.*
** *Corresponding author.*
*** *Corresponding author.*
E-mail addresses: elchem@yonsei.ac.kr (H. Kim), cyjung@kier.re.kr (C.-Y. Jung), kty@kier.re.kr (T.-Y. Kim).
[1] D. Seo and M. Kim contributed equally to this work.
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