Preparation of Highly-Active Oxygen Reduction Reaction Catalyst by Direct Co-Pyrolysis of Biomass with KOH

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In this work, we developed a cost-effective, facile approach to obtain nitrogen self-doped porous biomass-derived carbon catalyst by direct co-pyrolysis of corn straw biomass with KOH. Through characterization, the obtained catalyst possesses a quite high BET surface area up to 1461.36 m² g⁻¹ and significant pyrrolic-N content. Electrochemical test demonstrated that nitrogen self-doped porous carbon exhibits an excellent electrocatalytic activity for oxygen reduction reaction (ORR) in alkaline media, with onset potential of -0.06 V (vs Hg/HgO) and current density of -3.42 mA cm⁻², which is comparable to 20% Pt/C catalyst. More importantly, obtained catalyst shows high stability and durability towards ORR reaction. Our results demonstrated that the co-pyrolysis process is a promising route for economical and sustainable utilization of biomass towards the effective metal-free ORR catalysts for alkaline fuel cell.

Keywords: biomass, KOH, ORR catalyst, co-pyrolysis

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