ELECTROREDUCTION OF OXYGEN ON TRANSITION METAL- AND NITROGEN-DOPED CARBON CATALYSTS PREPARED FROM RAPESEED PRESS CAKE

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Low-temperature fuel cells are among the most promising solutions for clean and efficient energy, but dependence on expensive Pt-based catalysts hinders the widespread deployment of these devices. Great efforts have been made to develop active and stable non-precious metal catalysts for the electrochemical oxygen reduction reaction (ORR) occurring on the fuel cell cathode. The most promising for anion exchange membrane fuel cell (AEMFC) cathodes are transition metal-containing nitrogen-doped carbon materials [1]. These are usually synthesized by high-temperature pyrolysis process from carbon, nitrogen, and transition metal precursors.

In this work, we have used rapeseed press cake as the organic precursor, dicyandiamide (DCDA) as a nitrogen source and Fe and/or Co salts for preparing electrocatalysts via a simple one-step pyrolysis process [2]. The rotating disk electrode (RDE) method was used to assess the electrocatalytic activity of the prepared materials. The resulting catalysts showed excellent ORR activity, comparable to commercial Pt/C (20 wt %) with the acid-treated bimetallic material (FeCoNCR-a) being the most active. The bimetallic catalyst also showed high stability in a short-term test and good tolerance to methanol. The catalyst was further tested in an AEMFC where it displayed moderate performance, reaching a peak power density of 131 mW cm^{-2}.

References

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