

NANOSIZED CoM/rGO COMPOSITES AS AN EFFICIENT OXYGEN REDUCTION ELECTRODE MATERIAL

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The oxygen reduction reaction (ORR) is a key cathodic reaction in alkaline fuel cells (AFCs) and metal-air batteries (MABs); yet its sluggish kinetics remain a major limiting factor of their performance. Although platinum-based materials exhibit high ORR activity, their high cost, scarcity and insufficient durability motivate the search for alternative materials [1-3]. In this context, earth-abundant transition metals, especially cobalt (Co), have emerged as relevant ORR electrocatalysts owing to their electronic structures and favorable interactions with ORR intermediates.

In this work, electrocatalysts based on Co combined with iron (Fe) or nickel (Ni) and supported on reduced graphene oxide (rGO) were investigated for ORR in alkaline media by linear sweep voltammetry using a rotating disc electrode. Key ORR kinetic parameters including onset potential (E_{onset}), half-wave potential ($E_{1/2}$) and Tafel slope (b) were determined. Both materials showed similar values of E_{onset} (0.81 V for CoNi/rGO and 0.83 V for CoFe/rGO) and $E_{1/2}$ (0.71 V for CoNi/rGO and 0.72 V for CoFe/rGO). However, CoNi/rGO exhibited a significantly lower Tafel slope (75 mV dec⁻¹) compared to CoFe/rGO (161 mV dec⁻¹), indicating a more favorable ORR rate. In conclusion, both tested Co-based composites demonstrated good performance for ORR, making them promising, more affordable alternatives to cathode materials for AFCs and MABs.

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