MANGANESE/COBALT-BASED CATALYSTS FOR METAL-AIRBATTERIES: SYNTHESIS, CHARACTERIZATION AND PROPERTIES

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In recent years, metal–air batteries have attracted considerable attention due to their outstanding energy storage potential, causing extensive efforts in their research and development. The oxygen reduction (ORR) and oxygen evolution (OER) reactions are key catalytic processes for sustainable energy technologies, such as water electrolysis, fuel cells or metal-air batteries. Researchers have focused on exploring various catalysts because their composition and structure strongly influence the electrochemical performance and overall efficiency of these systems. In this study, the synthesis of manganese and manganese-cobalt supported graphene composites was successfully accomplished through the utilization of microwave synthesis. The prepared samples were characterized using scanning electron microscopy, X-ray diffraction, and inductively coupled plasma optical emission spectroscopy. The composites were then used for ORR in a 0.1 M KOH solution and for OER in a 1 M KOH solution via linear sweep voltammetry (LSV). The findings indicate that the manganese-cobalt/graphene catalyst exhibits reduced overpotential and superior OER properties compared to the pure manganese/graphene catalyst. In contrast, the pure manganese/graphene catalyst exhibited a higher and more effective electrocatalytic activity toward ORR, with onset and half-wave potentials of approximately 0.86 V and 0.70 V, respectively, compared to manganese-cobalt/graphene (0.7 V and 0.6 V, respectively). These results suggest the presence of a four-electron electron transport pathway in an alkaline 0.1 M KOH solution. In contrast, a two-electron electron transport pathway was identified on the manganese-cobalt/graphene catalyst, indicating heightened hydrogen peroxide production activity.

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