Effects of Silver Modification of $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_{3-\delta}$ Cathode on the Catalytic Activity for the Oxygen Reduction Reaction in a Flexible Al-Air Battery

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An additive-free 3D hierarchical air electrode, consisting of silver-decorated perovskite oxide $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_{3-\delta}$ (LSM)/carbon fiber cloth (CFC), was designed and synthesized by a hydrothermal-calcination route. The surface chemistries and microstructures of Ag/LSM/CFC were characterized, and its bifunctional electrocatalysis effects were examined in this article. The results showed that the catalytic activity of LSM/CFC toward the oxygen reduction reaction (ORR) was greatly improved by the silver modification. The superior 3D hierarchical electrode microstructure and the good interface between the silver and LSM resulted in a large electrochemical active area and more catalytic sites. Ag/LSM/CFC exhibited a high half-wave potential of 0.833 V, a small Tafel slope of 48.81 mV·dec⁻¹ and a large electrochemical surface area (C_{dl} =82.16 mF·cm⁻²) in 0.1 M KOH solution at room temperature. Furthermore, a flexible Al-air battery with this kind of 3D hierarchical air electrode delivered a high power density of 5.14 mW·cm⁻² and excellent stability.

Keywords: $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_{3-\delta}$ (LSM), Silver, 3D hierarchical air electrode, Oxygen reduction reaction (ORR), Al-air battery

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