Oxygen electrodes based on electro-spun spinel-type oxides supported on carbon nanofibers for alkaline metal-air batteries

V. Baglio a , C. Busacca a , A. Di Blasi a , O. Di Blasi a , E. Modica a , M. Bottari a , A.S. Aricò a , V. Antonucci a , C. Alegre b

a CNR-Istituto di Tecnologie Avanzate per l'Energia "Nicola Giordano" (ITAE), Messina, Italy.

b CSIC-Instituto de Carboquímica (ICB), Zaragoza, Spain.

Rechargeable alkaline metal–air batteries are envisaged as commercially viable energy storage devices due to their high theoretical energy densities respect to lithium-ion batteries. However, they do not still offer adequate practical energy density and life cycle due to critical problems arising from the positive electrode, such as slow kinetics of the oxygen reduction (ORR) and oxygen evolution (OER) reactions. In the last few years, research was focused on the development of highly efficient oxygen reduction/evolution catalysts based on transition metals, such as Co, Fe, Mn, La, etc, in the form of mixed oxides (perovskites, spinels, etc.), or advanced carbon materials. Co-based catalysts have been thoroughly investigated for the ORR/OER, and, usually, Co 3 O 4 is the most employed formulation. However, the electrical conductivity of bare Co 3 O 4 is not appropriate for the application in most of these devices. Other transition metals (Ni, Fe, Mn, etc.) can partially replace Co atoms in the Co 3 O 4 spinel structure, improving its electronic conductivity while promoting oxygen evolution. Another approach is to combine these oxides with carbon nanostructures, in particular graphitic ones, in order to maintain suitable stability under cycling operation. These approaches are evaluated and presented in this work. Acknowledgements: The research leading to these results has received funding from the "Accordo di Programma CNR-MiSE, RdS PTR 2019-2021 - "Progetto 1.2 Sistemi di accumulo, compresi elettrochimico e power to gas, e relative interfacce con le reti".