

Preparation and Characterization of Inorganic MCM-41 Membrane for Zinc-Air Microbattery

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Abstract

Zinc-air microbatteries have been fabricated utilizing novel nanoporous inorganic MCM-41 membrane. MCM-41 material consists of hexagonally-ordered pore structure and characterized by its large surface area and pore volume, narrow pore size distribution, tuneable pore size, adjustable hydrophobicity and very good thermal stability. The dimension of the fabricated zinc-air microbattery was 1 cm² area and ca. 300 μm thick. MCM-41 membrane was synthesized on the electrodeposited zinc electrode by dip-coating method from a pregnant solution consisting of cetyltrimethylammonium bromide (CTAB), tetraethylortosilicate (TEOS), hydrochloric acid, ethanol and distilled water. its thickness was ca. 5 μm. Due to the hydrophilic nature of the as-synthesized MCM-41, it serves both as the cell's separator and the electrolyte matrix. The Zn/MCM-41/air microbattery was able to deliver a maximum power density of 32 mW cm⁻².