Facile Synthesis of Pd_3Co Bimetallic Hollow Nanospheres and Their Application for Rechargeable Li-O_2 Batteries.

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Lithium-oxygen (Li-O_2) batteries have attracted much attention due to their high theoretical specific energy and energy density compared to conventional lithium ion batteries, and are one of the most promising high-energy-storage systems for electric vehicles (EVs) and hybrid electric vehicles (HEVs). The theoretical specific energy and energy density of a Li–O_2 battery with the discharge reaction [$2Li + O_2 \rightarrow Li_2O_2$] are 3505 Wh kg^{-1} and 3436 Wh l^{-1}, respectively. However, their poor round-trip efficiency and low cycle life have limited their commercialization. The poor round-trip efficiency is the result of the sluggish reaction kinetics during cycling, which gives rise to a high overpotential. The carbon electrode also reacts with the discharge products (Li_2O_2) and promotes electrolyte decomposition during cycling in the Li–O_2 cell, which produces the side reaction products such as lithium carbonate (Li_2CO_3), lithium formate monohydrate (HCO_2Li), and lithium acetate (CH_3CO_2Li). This eventually leads to a much shorter cycle life than would be expected. Therefore, making the design of a carbon-free cathode with high catalytic catalysts and suitable pore structure is the key to enhance the performance of Li-O_2 batteries. In this work, for the first time, Pd_3Co bimetallic hollow nanospheres was investigated as a carbon-free cathode materials in Li-O_2 batteries. Pd_3Co hollow spheres were synthesized by simple polyol method and used for cathode materials. The resulting Li-O_2 cell demonstrated high energy efficiency and improved cycling stability, which were attributed to the high catalytic activity and pore structure of Pd_3Co hollow spheres.

Reference to a journal publication:

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