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Polymer-derived nitrogen-doped carbon nanocage as an enhanced oxygen electrode in Li-O2 battery

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Recently, Li-O_2 batteries have emerged as advantageous energy storage device, due to their extremely high theoretical energy density compared to commercial Li-ion batteries. The oxygen electrode has been identified as a key factor influencing the overall performance of Li-O_2 batteries. During discharging, Oxygen Reduction Reaction (ORR) occurs and insoluble discharge product Li_2O_2 is formed as a product on the electrode. The insoluble and insulating discharge product becomes decomposed during charge through the reverse reaction, Oxygen Evolution Reaction (OER). As charging and discharging processes are repeated, it is important to control the deposition and decomposition of Li_2O_2 efficiently for improvement in Li-O_2 battery performance in aspects of increased capacity and cycle stability. In this regard, many researches have been conducted for promoting ORR and OER in Li-O_2 battery which is highly related to Li_2O_2 formation and decomposition, respectively. Herein, we present the Polydopamine (PDA)-derived nitrogen-doped graphitic Carbon Nanocage (CNC) for a bi-functional oxygen electrode in Li-O_2 battery. Nitrogen was successfully and uniformly doped on graphitic CNC by utilizing adhesive property of PDA which also contains high concentration of amine group itself and subsequent heat treatment. The doped nitrogen content and heat treatment temperature were optimized in order to maximize the nitrogen doping effect. Various physical and electrochemical characteristics were investigated as an oxygen electrode in Li-O_2 battery. As a result, the PDA-derived nitrogen-doped CNC improved the performance of Li-O_2 batteries in terms of increased capacity, promoted rate capability and extended cycle life.

Biography

Heejun Kweon has received her Bachelor's degree in Environment & Energy Engineering at Gachon University. Presently, she is in combined course of Master and PhD at Department of Chemical and Bio-molecular Engineering in Yonsei University. Her research interest is synthesis and analysis of electro-catalytic materials for Li-air battery system.

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