13th International Conference on

Electrochemistry

May 27-28, 2019 | Barcelona, Spain

Size-controllable Co_3O_4 nanograin-decorated Co(OH)2 sheets synthesized with MOF templates for high-performance all-solid-state asymmetric supercapacitor electrodes

Gyeongseop Lee

Seoul National University, South Korea

In this study, a novel hybrid structure of homogeneously distributed Co_3O_4 nanograins on a hexagonal $Co(OH)_2$ plate (CNG/$Co(OH)_2$) is synthesized using a one-pot hydrothermal reaction of zeolitic imidazolate framework-67 (ZIF-67). Particularly, because Co-containing ZIF-67 serves as a self-template during the hydrothermal conversion process, various-sized CNG/$Co(OH)_2$ can be prepared using different sizes of ZIF-67 as the precursor material. The unique structural features of CNG/$Co(OH)_2$ effectively boost the electrochemical activation of the active materials (i.e., Co_3O_4, $Co(OH)_2$) by preventing aggregation. Among the various-sized CNG/$Co(OH)_2$, large-sized CNG/$Co(OH)_2$ (L_CNG/$Co(OH)_2$) exhibits the highest capacitance (1284 F g−1 at 1 A g−1), indicating that the electrochemical performance is improved as the size of the hybrid architecture increases. Furthermore, multifarious all-solid-state asymmetric supercapacitors (ASCs) are successfully fabricated with various-sized CNG/$Co(OH)_2$ as the positive electrode and mesoporous plasma-reduced graphene oxide (MPRGO) as the negative electrode. Owing to the synergistic contributions from the two electrodes, the L_CNG/$Co(OH)_2$-based ASC delivers a maximum energy density of 41.2 Wh kg−1 at 2.8 kW kg−1, and holds 31.5 Wh kg−1, even at the highest power density of 45 kW kg−1, demonstrating great potential for next-generation energy storage devices.

Biography

Gyeongseop Lee received his BSc in Chemical and Biological Engineering from the Sogang University in 2014. He is currently pursuing a PhD degree in Chemical and Biological Engineering at the Seoul National University under the supervision of Prof. Jyongsik Jang. His research mainly focuses on zeolitic imidazolate framework-derived materials and their composites for supercapacitor applications.

Notes: