Title: METAL ORGANIC FRAMEWORK DERIVED HOLLOW ARRAYS FOR FLEXIBLE ENERGY STORAGE AND CONVERSION

Abstract: Metal–organic frameworks (MOFs) are promising porous precursors for the construction of various functional materials for high-performance electrochemical energy storage and conversion. Herein we report several facile methods to rational design of novel nanoarrays on flexible carbon cloth substrate. One example is hollow NiCo2O4 nanoarrays obtained from a two-dimensional (2D) cobalt-based MOF. When evaluated as a flexible electrode material for supercapacitor, the as-fabricated NiCo2O4 electrode shows remarkable electrochemical performance with excellent rate capability and long cycle life. Another example is hollow Co3O4 nanospheres embedded in nitrogen-doped carbon nanowall arrays on flexible carbon cloth (NC-Co3O4/CC). A carbon onion coating constrains the Kirkendall effect to promote the conversion of the Co nanoparticles into irregular hollow oxide nanospheres with a fine scale nanograin structure, which enables promising catalytic properties toward both OER and ORR. The integrated NC-Co3O4/CC can be used as an additive-free air-cathode for flexible all-solid-state zinc-air batteries, which presents high open circuit potential (1.44 V), high capacity (387.2 mAh g-1, based on the total mass of Zn and catalysts), excellent cycling stability and mechanical flexibility. Our work provides good examples of rational design of hollow nanostructured arrays with high electrochemical performance and mechanical flexibility, holding great potential

for future flexible multi-functional electronic devices.

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Professor Guan's group focuses on flexible energy storage devices, including self-assembling of 3D electrode, surface/structure engineering and the application for flexible energy storage devices (Supercap, aqueous battery, LIB, Zn-air and so on). He published over 60 peer-review papers in international journals in Materials Science, including 15 ESI highly cited papers, and has a total citation of 4000+, H-index is 35. As first author and corresponding author, he has published 30+ papers, including Adv. Mater. (3), Energy Environ. Sci. (2), Nano Lett. (1), Adv. Energy. Mater. (2) , ACS nano (1) , Adv. Funct. Mater. (3) , Nano Energy (2) , ACS Energy Lett. (1) , Adv. Sci. (2), ACS catal. (1) , Small (4). He also serves as Advisory Panel for Nanotechnology. He has been served as journal reviewer for 30+ Journals, including Adv. Mater., Adv. Energy Mater. and ACS nano.