Waste to treasure: Crayfish shells to store energy

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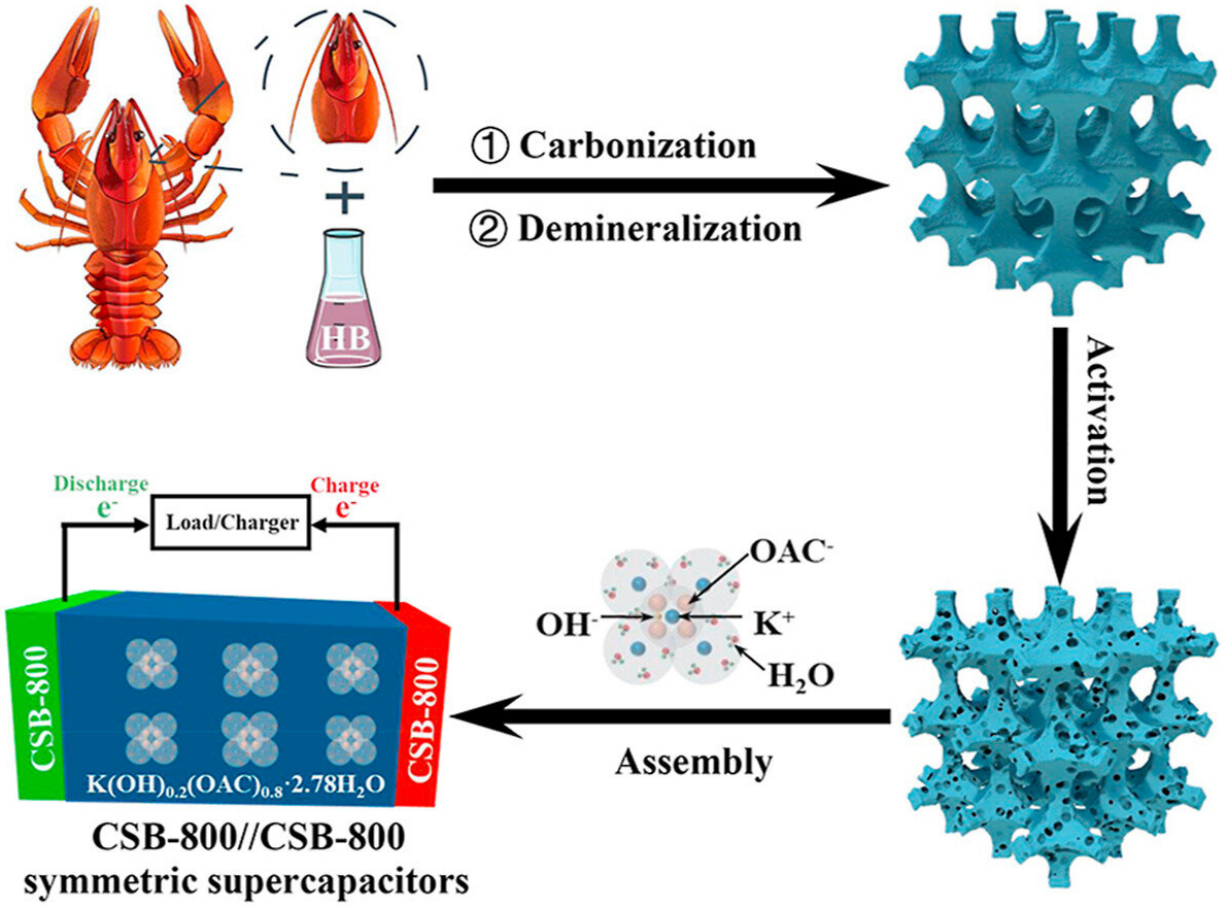

Schematic diagram of preparing HPCs with heavy bio-oil (HB) assisted by crayfish shell. Credit: Luo Zejun et al

More than just a spicy night snack, the crayfish has been endowed with

greater significance. Prof. Zhu Xifeng's team from University of Science and Technology of China (USTC) of the Chinese Academy of Sciences (CAS) made it possible to use crayfish shell as the biological template for high-performance supercapacitors. This work was published in *Carbon*.

Compared with other high-performance materials, biomass has long been regarded as a promising one for its environmental-friendliness and wide availability. However, practical application of biomass is restricted by relatively rare efficient storage sites, low diffusion kinetics and the need for huge amount of premade nano templates.

To solve these problems, the researchers innovatively introduced crayfish shells to initiate the biological template.

Shells were dried, ground and pretreated in an alkaline solution to retrieve templates, which were then mixed with the heavy fraction of bio-oil derived from agricultural waste to manufacture hierarchical porous carbons, a kind of supercapacitor material.

The mixed product delivered very good capacitance of 351 F/g thanks to its ultrahigh specific surface area, large total pore volume and reasonable content of oxygen atoms, which are of importance to a capacitor.

Besides, the symmetric supercapacitors assembled by the synthetic samples showed a superior energy density of 20 Wh/kg at a power density of 350W/kg, preceding other biomass materials.

This method possesses an environmentally friendly solution for the power storage problem of the rapidly growing market for wearable displays, electric vehicles and smartphones.

More information: Zejun Luo et al, Synthesis of 3D-interconnected

hierarchical porous carbon from heavy fraction of bio-oil using crayfish shell as the biological template for high-performance supercapacitors, *Carbon* (2020). DOI: 10.1016/j.carbon.2020.11.083

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