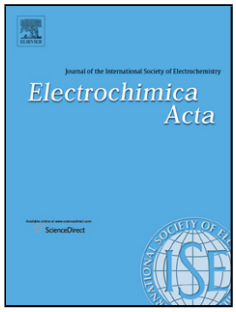

Title: Modulating structural hierarchies of manganese oxide in morphology and porosity by marine biopolymer for improved supercapacitors

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<AT>Modulating structural hierarchies of manganese oxide in morphology and porosity by marine biopolymer for improved supercapacitors

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<ABS-HEAD>Abstract

<ABS-P>Nanostructured MnO_2 is one of the most promising electrode materials for supercapacitors (SCs) on account of its exceptional properties including high theoretical capacitance, natural abundance, environmental safety and low cost. However its merits cannot be fully embodied by its current synthesis approaches, since most of them were normally tedious, costly, low yield or environment unfriendly, and poor in controlling multiple parameters of MnO_2. Inspired by biopolymer-assisted synthesis of hierarchical inorganic materials in living systems, a marine biopolymer was used for structurally-controllable synthesis of MnO_2 in this study. Functioning as the reductant, surfactant and directing agent, alginate could tune the hierarchical architecture of MnO_2 in multiple parameters including the dimension, nanometric size, crystallographic form and porosity, where δ-MnO_2 nanocrystals with the size of 5~10 nm first assembled into nanosheets, and then flower-like structure with particle size tunable within 40~200 nm as well as micro- and mesopores. Due to these unique hierarchies in both the morphology and porosity, as-prepared MnO_2 exhibited excellent performance as SC electrode, e.g. high power density (32.5 kW kg^{-1}), high energy density (75.1 Wh kg^{-1}) and great cycling stability. Given the green, low-temperature and scalable one-step process, this synthesis may pave a highly promising way to massive production of MnO_2 electrode materials for SCs.

<KWD>Keywords: hierarchical nanostructure; manganese oxide; marine biopolymer; supercapacitors