conferenceseries.com

Chunmei Ding et al., J Material Sci Eng 2017, 6:1 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.058

Hierarchical conducting polymers micro/nanostructures and their electrochemical energy conversion

Chunmei Ding, Yanzhao Guo, Guanyuan Ren and **Ying Zhu**
Beihang University, China

The heterocyclic conjugated polymers, including polyaniline (PANI), polypyrrole (PPy) , and poly(3,4-ethylenedioxythiophene) (PEDOT), have recently been investigated as inexpensive electro-catalysts because of their low cost, high electronic conductivity, and distinct redox properties. Generally speaking, these polymers can act as electrochemical catalysts in the following three ways: 1) as catalysts on their own, 2) as precursors for pyrolyzed M-Nx/C catalysts, and 3) as matrix for entrapping non-precious metals, 4) Conducting polymers with its micro/nanostructures over a large surface area can itself be an outstanding intrinsic electrochemical catalyst. We have developed a new class of efficient non-precious-metal ORR catalysts by doping PEDOT with hemin via a one-step self-assembling mothod. It is demonstrated that the hemin-induced synergistic effect results a very high 4-electron oxygen reduction reaction (ORR) activity, a better stability, and free-from methanol crossover effect even in a neutral phosphate buffer solution due to hemin molecular characteristic, in which the iron centre of Fe-N 4 –C served for ORR, while the carboxyl groups used dopant for conducting PEDOT. Moreover, PANI nanofibers fabricated by electrochemical polymerization of aniline can act as a solid-state polymeric mediator for bacterial extracellular electron transfer (EET), which enables not only the dramatically enhanced EET current at a certain potential but also tunable EET behavior in a controlled manner.

Biography

Zhu's research efforts were devoted to fabricate multi-scale and multi-functionalized conducting polymer nanostructures (e.g. polyaniline) self-assembled by template-free method, and exploit their potential applications in electrochemical energy conversion and storage. She developed a simple, universal and controllable method for constructing the hierarchical and multi-functionalized 3D-microstructures self-assembled from 1D-nanostructures by a cooperation effect between the micelle soft-templates and self-assemble driving forces. She found that the aligned polyaniline or polypyrrole nanowires or PEDOT nanostrutures can be acted as electrodes for enhancing the oxygen reduction reaction, electron transfer of bacteria, and improving electrochemical performance of supercapacitors. These findings expend the application of conducting polymer nanostructures in electrochemical energy conversion and storage.

zhuying@buaa.edu.cn

Notes: