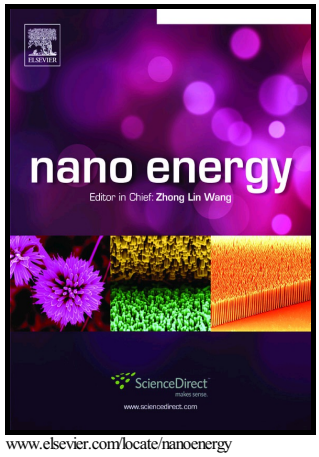
Author's Accepted Manuscript



www.elsevier.com/locate/nanoenergy

Multifunctional electrocatalysts derived from conducting polymer and metal organic framework complexes

Mohd. Khalid, Ana M.B. Honorato, Hamilton Varela, Liming Dai

PII: S2211-2855(17)30819-4
DOI: https://doi.org/10.1016/j.nanoen.2017.12.045
Reference: NANOEN2426

To appear in: *Nano Energy*

Received date: 22 November 2017
Revised date: 27 December 2017
Accepted date: 27 December 2017

Cite this article as: Mohd. Khalid, Ana M.B. Honorato, Hamilton Varela and Liming Dai, Multifunctional electrocatalysts derived from conducting polymer and metal organic framework complexes, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2017.12.045

Multifunctional electrocatalysts derived from conducting polymer and metal organic framework complexes

Mohd. Khalid[1,2], Ana M.B. Honorato[1], Hamilton Varela[2,*], Liming Dai[1,*]

[1]Center of Advanced Science and Engineering for Carbon (Case4carbon), Department of Macromolecular Science and Engineering, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106, USA.
[2]Institute of Chemistry of São Carlos, University of São Paulo, POBox 780, 13560-970, São Carlos, SP, Brazil.
hamiltonvarela@usp.br
lxd115@case.edu (L. Dai),
*Corresponding authors.

Abstract

High cost, scarcity, and detrimental environmental effect of the noble-metal based catalysts have prompted the seek of less expensive, more benign, and earth abundant substitutes for energy conversion and storage. Here, we demonstrate a novel multifunctional electrocatalyst constructed by pyrolysis of the complex of polyaniline (PANI) and metal organic framework [Co-based MOF; zeolitic imidazolate framework (ZIF-67)]. The resultant PANI/ZIF-67 complex unveiled excellent electrocatalytic activities towards oxygen reduction reaction (ORR), oxygen evolution reaction (OER), and hydrogen evolution reaction (HER) in alkaline medium. It was found that the catalytic activities of the PANI/ZIF-67 complex towards ORR, OER and HER could be tuned by simple changing the weight ratio of PANI to the MOF. Further, we tested the material as an air electrode for a primary zinc-air battery, demonstrating an open-circuit potential of 1.42 V and a peak power density of ~ 45 mW cm^{-2} - both are superior to those of its counterpart of the Pt/C air-electrode. The excellent multifunctional catalytic activities of the PANI/ZIF-67 are mainly attributed to the synergistic combination of cobalt nanoparticles, Co_3O_4, and nitrogen doped carbon from the PANI/ZIF-67 complex after pyrolysis.