Meetings International
SciTechnol
Animesh Roy et al., J Nanomater Mol Nanotechnol 2018, Volume 7
DOI: 10.4172/2324-8777-C3-027

International Conference on

MATERIALS SCIENCE & ENGINEERING

June 25-26, 2018 | Rome, Italy

Hydrazine hydrate promoted solvothermal syntheses of Ni_3Fe alloys for efficient oxygen evolution reaction

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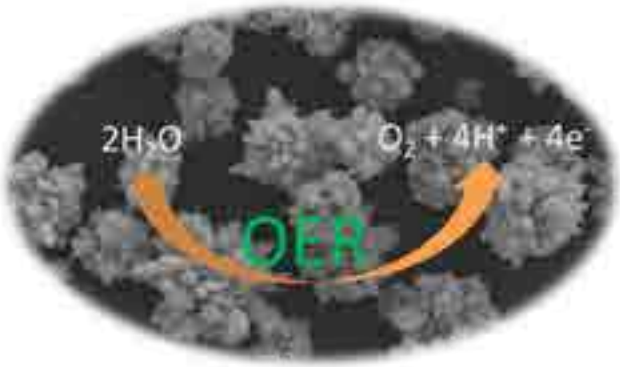
The use of earth abundant elements for the efficient electrochemical conversion of H_2O to H_2 and $1/2O_2$ is of great importance to solar-fuels devices. In these processes, the oxygen evolution reaction (OER) is of significant importance because of its sluggish kinetics and complicated four-electron transfer process. Herein, we have synthesized a star shaped flower like Ni_3Fe bimetallic electrocatalyst using a simple solvothermal reaction at 100 oC in water and ethanol solution, separately. XRD confirms the Ni_3Fe phase and there is no impurity in the final product. The strong intensity of the XRD pattern suggests the high crystallinity of the product obtained even at such a low temperature of 100 °C. Ni_3Fe catalyst prepared in water solvent showed superior OER activity with least overpotential and long term stability. Our primary figure of merit is the overpotential required to achieve a current density of 10 mA cm^{-2} per geometric area, approximately the current density expected for a 10% efficient solar-to-fuels conversion device. The superior performance of the catalyst is mainly due to the 3-dimensional secondary growth which provides higher electrochemical surface area, low diffusion resistance and fast movement of ions. This work was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF 2016R1D1A1B03930855).



Biography

Animesh Roy has completed his master degree from Sardar Patel University, Gujarat, India and currently, pursuing Ph. D from Department of Energy Science and Technology, Myongji University, Republic of Korea. His research interests mostly deal with the design and synthesis of nanomaterials for electrochemical energy storage and conversion applications.

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