7th Regional Symposium on Electrochemistry

RSE-SEE

South-East Europe

&

8th Kurt Schwabe Symposium

Book of Abstracts

May 27 – 30, 2019, Split, Croatia

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Published by
International Association of Physical Chemists
E-mail: office@iapchem.org, URL: http://www.iapchem.org

For Publisher

Zoran Mandić

Editors

Višnja Horvat-Radošević, Krešimir Kvastek, Zoran Mandić

Design, Page Making and Computer Layout

Aleksandar Dekanski

ISBN 978-953-56942-7-4

On Line version only

Electrochemical approaches in synthesis of high surface area materials

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It is the aim of our work to carry out fundamental studies on designing and synthesizing high surface area functionalized foam and ordered structures for their potential sensing and energy related applications. We combine electrochemical synthesis with structural studies on different length scales including transmission electron microscopy. Templates are directly grown by electrodeposition, either by hydrogen bubble formation or by utilizing of ordered structures formed by anodic electrochemical oxidation. [1-3] We employed an elegant approach to obtain open, foam deposits of Ni and Ni alloys, by using electrodeposition at high current densities, to promote hydrogen evolution and bubble templating (cf. Fig.1). [1] In the next step, the high surface area of such materials was funtionalized by Pd utilizing galvanic displacement reaction. Electrochemical testing of the obtained open foam deposits shows promissing catalytical activity for hydrogen evolution in alkaline environments, as well as methanol and ethanol oxidation. In the case of fabrication of nanodendritic Ag simultaneously grown with porous anodic aluminium oxide we accomplished well anchored dendritic Ag nanostructures [2] of long-term stability [3].

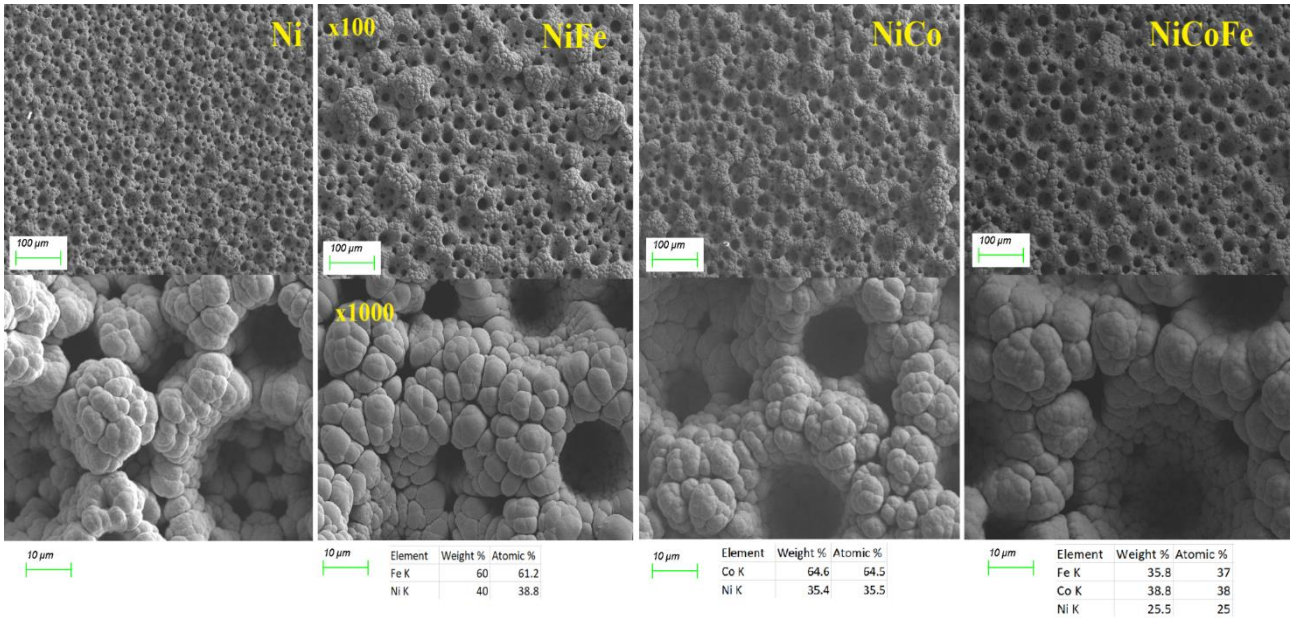

Figure 1. Sem images of high surface area Ni and Ni alloys obtained by dynamic hydrogen template bubble deposition.

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