



Serbian | Српско
Microscopy | Друштво за
Society | Микроскопију

MCM2019

PROCEEDINGS

from the

14th MULTINATIONAL CONGRESS ON MICROSCOPY

September 15–20, 2019, Belgrade, Serbia

PROCEEDINGS
from the
**14th MULTINATIONAL
CONGRESS
ON MICROSCOPY**

SEPTEMBER 15–20, 2019, BELGRADE, SERBIA

MCM2019
14th MULTINATIONAL CONGRESS ON MICROSCOPY
SEPTEMBER 15–20, 2019 IN BELGRADE, SERBIA

TITLE:

Proceedings from the 14th Multinational Congress on Microscopy, September 15–20, 2019, Belgrade, Serbia

PUBLISHERS:

University of Belgrade, Institute for Biological
Research "Siniša Stanković", National Institute of Republic of Serbia
Serbian Society for Microscopy, Serbia

FOR PUBLISHERS:

Dr. Mirjana Mihailović
Dr. Jasmina Grbović Novaković

EDITORS:

Dr. Jasmina Grbović Novaković
Dr. Nataša Nestorović
Dr. Dragan Rajnović

ISBN 978-86-80335-11-7

PRINT:

Knjigoveznica i kartonaža Grbović M. Milica, M. Gorkog 43, Beograd 11000, Serbia
30 e-copies

Copyright © 2019

by Institute for Biological Research "Siniša Stanković" and others contributors.

All rights reserved. No part of this publication may be reproduced, in any form or by any means,
without permission in writing from the publisher

INVITED LECTURE

Electrochemical approaches to design materials for potential sensing and energy related applications

LIDIJA D. RAFILOVIĆ¹, CHRISTOPH GAMMER², TOMISLAV TRIŠOVIĆ³, CHRISTIAN RENTENBERGER⁴, ALEKSANDAR Z. JOVANOVIĆ⁵, IGOR A. PAŠTI⁵, H. PETER KARNTHALER⁴
¹ CEST, Centre of Electrochemical Surface Technology, Wr. Neustadt, Austria; ² Erich Schmid Institute of Materials Science, Leoben, Austria; ³ Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Belgrade, Serbia; ⁴ University of Vienna, Faculty of Physics, Physics of Nanostructured Materials, Vienna, Austria; ⁵ University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia

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]. Recently we also demonstrate the synthesis of highly defected Al coatings by electrodeposition [4].

We employed an advanced approach to obtain open foam deposits of Ni and Ni alloys, by using electrodeposition at high current densities which promote hydrogen evolution and bubble templating (cf. fig.1 and fig.2) [1]. In the next step, the high surface area of such materials was functionalized by Pd utilizing a galvanic displacement reaction. Electrochemical testing of the obtained open foam deposits shows promising catalytic 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 (cf. fig.3), we accomplished well anchored dendritic Ag nanostructures [2] of long-term stability [3].

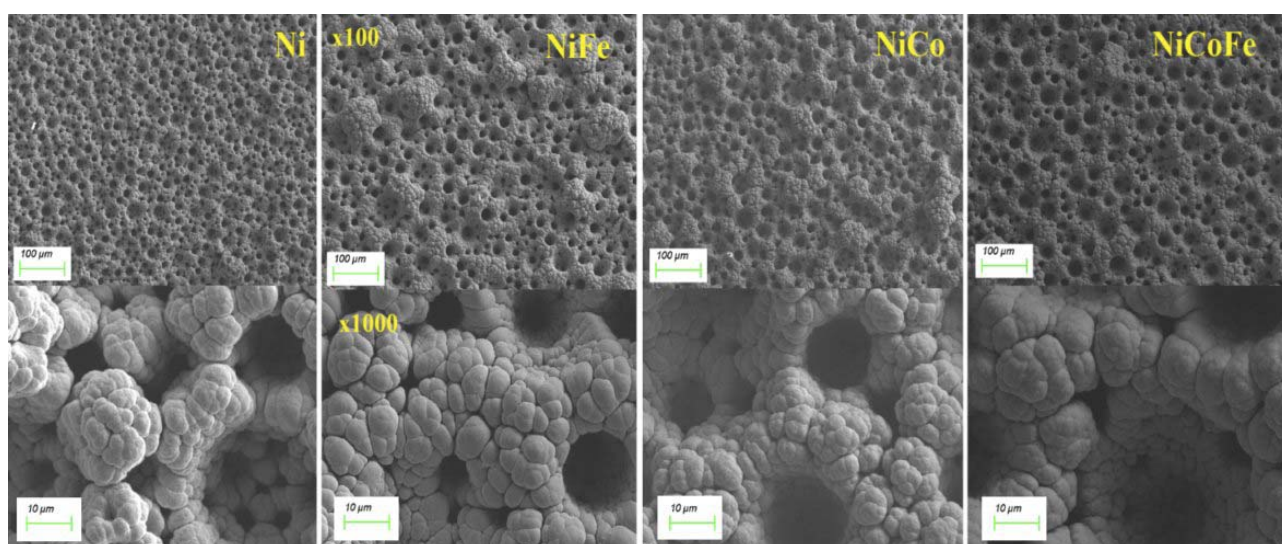


Figure 1. SEM images of high surface area foams of Ni and Ni alloys showing an open porous ‘cauliflower-like’ morphology, obtained by dynamic hydrogen template bubble deposition. The catalytic activity of NiCoFe foam is strongly enhanced for both, cathodic reduction of oxygen and anodic evolution of oxygen showing a good reversibility. Therefore, this new material is promising as bifunctional catalyst in electrochemical energy conversion and storage devices [1].

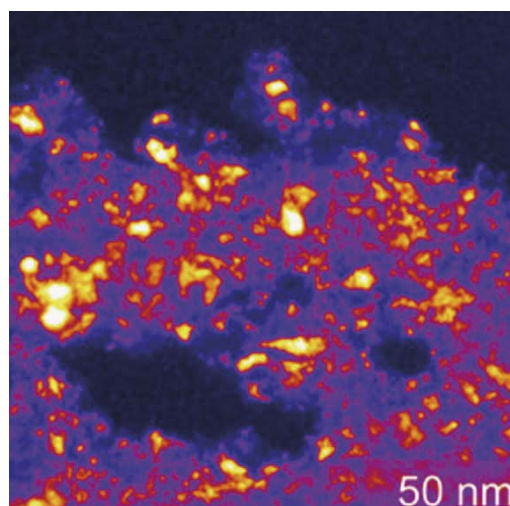


Figure 2. Open dendritic NiCoFe foam obtained by electrodeposition. TEM dark field image of the highly branched dendritic structure with crystallites smaller than 10 nm [1].

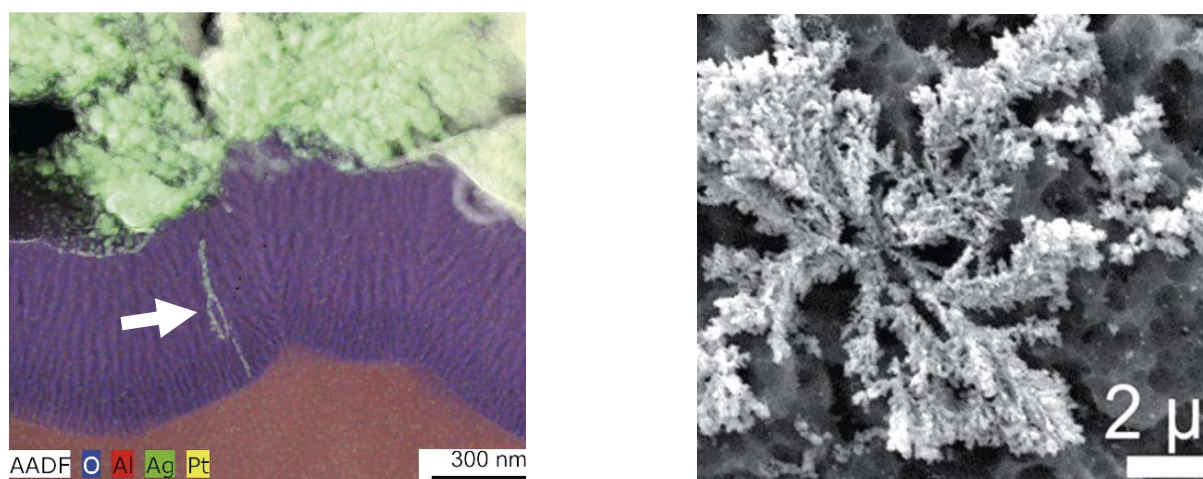


Figure 3. Aluminium oxide functionalized by Ag dendrites deposited at the anode during simultaneous electrochemical oxidation of Al. Ag is known for its high catalytic effectiveness in electrochemical oxygen reduction. (a) STEM image artificially coloured according to the results of EDX analysis including the elements O, Al, Ag and Pt. A striking feature is the channel (marked) in the Al₂O₃ layer showing it contains Ag and indicating it acts as root of the Ag dendrite above [2]. (b) SEM image of Ag dendrite revealing its fine branched structure and several Ag nanoparticles distributed on the porous Al₂O₃ surface [3].

References

- [1] L. D. Rafailović, C. Gammer, C. Rentenberger, T. Trišović, C. Kleber, H. P. Karnthaler, *Nano Energy*, 2 (2012) 523
- [2] L.D. Rafailović, C. Gammer, C. Rentenberger, T. Trišovic, C. Kleber, H.P. Karnthaler, *Advanced Materials*, 27 (2015) 6438
- [3] L.D. Rafailović, C. Gammer, J. Srajer, T. Trisovic, J. Rahel, H.P. Karnthaler, *RSC Advances*, 6 (2016) 33348
- [4] L.D. Rafailović, C. Gammer, C. Ebner, C. Rentenberger, A. Z. Jovanović, I. A. Pašti, N. V. Skorodumova and H.P. Karnthaler, *Science Advances*, (2019) accepted

CIP – Каталогизacija у публикацији
Народна библиотека Србије, Београд

621.385.833.2(082)(0.034.2)
620.187(082)(0.034.2)
66.017/.018(082)(0.034.2)
57+61(082)(0.034.2)
57.086.3(082)(0.034.2)

MULTINATIONAL Congress on Microscopy (14 ; 2019 ; Beograd)
MCM2019 [Elektronski izvor] : proceedings / 14th Multinational Congress on
Microscopy, [September 15–20, 2019, Belgrade, Serbia] ; [editors, Jasmina
Grbović Novaković, Nataša Nestorović, Dragan Rajnović]. – Belgrade : Serbian
Society for Microscopy : Institute for Biological Research "Siniša Stanković" :
Serbian Society for Microscopy, 2019 (Beograd : Knjigoveznica i kartonaža
Grbović M. Milica). – 1 elektronski optički disk
(CD-ROM) ; 12 cm

Системски захтеви: Нису наведени. – Nasl. sa naslovne strane dokumenta. – Tiraž
30. – Bibliografija uz svaki rad

ISBN 978-86-80335-11-7 (IBRSS)

a) Електронска микроскопија – Зборници b) Наука о материјалима –
Зборници c) Биомедицина - Зборници

COBISS.SR-ID 279354124
