

3rd International Meeting
on
Materials Science for Energy Related Applications

held on September 25-26, 2018
at the University of Belgrade, Faculty of Physical Chemistry,
Belgrade, Serbia

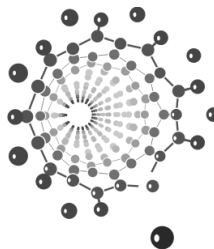
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and Applied Aspects of Physical Chemistry*

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UNIVERSITY OF BELGRADE
FACULTY OF PHYSICAL
CHEMISTRY
Belgrade, Serbia



in co-operation with
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PHYSICAL CHEMISTRY 2018

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and Applied Aspects of Physical Chemistry*

3rd International Meeting

MATERIALS SCIENCE FOR ENERGY RELATED APPLICATIONS

September 25-26, 2018, University of Belgrade – Faculty of Physical Chemistry, Belgrade, Serbia

BOOK OF ABSTRACTS

BELGRADE, SERBIA 2018

3rd International Meeting
on
Materials Science for Energy Related Applications

BOOK OF ABSTRACTS

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NiA AND NiX ZEOLITES AS ELECTROCATALYSTS FOR WATER SPLITTING IN ALKALINE MEDIA

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Water electrolysis represents a simple and clean method for production of hydrogen and oxygen. Nickel is a promising electrode material for large-scale application. Its activity could be improved by alloying it with other metals, non-metals or rare earth elements, or by fabrication in the form of foams or nanostructured composites, grafting onto a high surface area support, etc.

In this study, Ni²⁺ cation-exchanged zeolites NiA and NiX were tested as electrocatalysts for hydrogen and oxygen evolution reactions (HER and OER) in alkaline media (1 M KOH). Conventional ion-exchange procedure was used to prepare Ni²⁺ cation-exchanged forms of NaA and NaX zeolites. The obtained materials, NiA and NiX, are described by formula Ni₆(AlO₂)₁₂(SiO₂)₁₂ and Na₂₃Ni₃₂(AlO₂)₈₇(SiO₂)₁₀₅, respectively.

XRD analysis generally confirmed the crystalline structure of the studied materials. In the case of NiA, broadening of diffraction peaks at 2θ angle of 11, 24 and 35° indicated partial distortion of the zeolite crystal lattice during ion-exchange process.

Electrocatalytic activity of NiA and NiX for HER and OER was studied in 1 M KOH by recording polarization curves, chronoamperograms and electrochemical impedance spectra. For both reactions, NiA exhibited better catalytic activity than NiX, including higher current density and lower Tafel slope values. This could be correlated with higher Ni weight fraction in NiA than in NiX, and with higher electrical conductivity of NiA. Analysis of the electrochemical impedance spectra revealed that the HER is controlled by adsorption of the H_{ads} intermediate, while the OER is controlled by the charge transfer at the potentials of interest for the process. Relatively good stability of both materials during HER and OER was deduced from the chronoamperometric curves.