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BOOK OF ABSTRACTS

BELGRADE, SERBIA 2018

3rd International Meeting
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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, Ni^{2+} 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 Ni^{2+} cation-exchanged forms of NaA and NaX zeolites. The obtained materials, NiA and NiX, are described by formula $Ni_6(AlO_2)_{12}(SiO_2)_{12}$ and $Na_{23}Ni_{32}(AlO_2)_{87}(SiO_2)_{105}$, 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.

Electrocatalitic 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.