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# YUCOMAT 2022

**&**

**TWELFTH WORLD ROUND TABLE CONFERENCE ON SINTERING**

# XII WRTCS

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# Program
## and
# the Book of Abstracts

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## pH-triggered sol-gel synthesis of $Na_4Fe_3(PO_4)_2P_2O_7$ cathode material

Aleksandra Gezović[1], Miloš Milović[2], Danica Bajuk-Bogdanović[3], Veselinka Grudić[1], Slavko Mentus[3,4], Milica Vujković[3]
[1]*University of Montenegro, Faculty of Metallurgy and Technology, Cetinjski put bb, Podgorica, Montenegro*
[2]*Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Knez Mihajlova 35/IV, 11158 Belgrade, Serbia*
[3]*University of Belgrade, Faculty of Physical Chemistry, Studentski Trg 12–16, Belgrade, Serbia*
[4]*Serbian Academy of Sciences and Arts, Knez Mihajlova 35, Belgrade, Serbia*

The combination of different structural units in the anionic sublattice ($PO_4$–$SO_4$, $PO_4$–$NO_3$, $PO_4$–$CO_3$, etc.) can provide novel mixed polyanionic structures, which matched properties of Li-ion intercalation materials [1]. Mixed polyanion, $Na_4Fe_3(PO_4)_2P_2O_7$ (NFPP) is of special interest as a cathode for Na-ion batteries [2]. In this study, the simple citric-assisted sol-gel method was used for NFPP/C preparation, with the aim of evaluating its sodium storage capability. When both phosphates and pyrophosphates are used as precursors, the mixed NFPP phase has been successfully obtained, but only if pH is adjusted to the neutral value. Otherwise, when it comes to spontaneous sol-gel reaction (without pH adjustment), the heterostructure $Na_4Fe_3(PO_4)_2P_2O_7/Na_2FeP_2O_7$ was formed. The obtained polyanions have been examined in terms of the structural, thermal and morphological behaviour by XRD, FTIR, TG/DTA and FESEM. Their electrochemical examination in $NaNO_3$, by cyclic voltammetry and chronopotentiometry, reveals the substantial difference in sodium storage properties of synthesized nanocomposites. While the heterestrocture delivers the specific capacity of around 90 mAh $g^{-1}$ with a poor rate capability, the mixed phase can rich theoretical capacity of ≈ 129 mAh $g^{-1}$ (at a common scan rate), with a high rate capability of ≈ 80 C.

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