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VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI / INVITATION TO THE
LECTURE WITHIN DOCTORAL PROGRAMME IN
CHEMICAL SCIENCES

Prof. Igor Djerdj

Department of Chemistry
Josip Juraj Strossmayer University of Osijek

z naslovom / title:

High-entropy oxides for energy storage and catalysis

v sredo, 23. 11. 2022 ob 15. uri /
on Wednesday, 23. 11. 2022 at 15.00
v predavalnici 1 v 1. nadstropju Fakultete za kemijo in kemijsko tehnologijo, Večna pot 113 **/ in lecture room 1,** 1st floor at the Faculty of Chemistry and Chemical Technology, Večna pot 113

Vljudno vabljeni! / Kindly invited!

Abstract:

A new class of materials with enhanced physical and chemical properties and high potential application are multi-component oxides or high-entropy oxides (HEOs). These entropy-stabilized oxides mostly comprise five or more elemental components in an equimolar ratio, incorporated within a single-phase system. The thermodynamic contribution of configurational entropy in the system of minimally five different components is sufficient to overcome the enthalpy of formation and reduce the Gibbs free energy. In this talk, photocatalytic behaviour towards AZO dye degradation and photoelectrochemical water splitting for hydrogen generation of five different rare-earth-based nanocrystalline high entropy oxides (HEOs) will be presented. The cationic site in the fluorite lattice consists of five equimolar elements selected from the group of rare-earth elements including La, Ce, Pr, Eu, and Gd and second-row transition metals, Y and Zr. Studied HEOs exhibit bandgaps in the range from 1.91 eV to 3.0 eV and appropriate valence and conduction bands for water splitting. They reveal high photocatalytic activity that is mostly attributed to the accessibility of more photocatalytic active sites which provided radicals responsible for the AZO dye degradation. The materials successfully produce hydrogen by photocatalytic water splitting, suggesting the potential of HEOs as new photocatalysts. The photocatalytic performances of all studied HEOs outperform the single fluorite oxides or equivalent mixed oxides. The Ce0.2Zr0.2La0.2Pr0.2Y0.2O2 (CZLPY) engender hydrogen in 9.2 μmolmg–1 per hour that is much higher content than for pristine CeO2 material which amounts to 0.8 μmolmg–1 per hour.