Materials 3. cycle - Graduate School – University of Nova Gorica

18. 11. 2022 at 2:30 p.m.

at

University of Nova Gorica - Ajdovščina Campus - Amphitheatre

Vipavska 11, Ajdovščina

and online

at this link: https://ungsi.zoom.us/j/95440570939

Meeting ID: 954 4057 0939

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High entropy oxides for photocatalytic water splitting applications

High entropy materials have become one of the most investigated topics in materials science in the past few years. They owe this increasing interest to their superior and outstanding properties compared to their constituent compounds. The effect of increased configurational entropy occurs when five or more ions occupy the same crystallographic site in a single compound thus forming a disordered structure. Increasing entropy in ceria could lead to an increase in surface defects, such as oxygen vacancies. Oxygen vacancies are the main reason for the high catalytic activity of ceria-based compounds.

In this seminar, five different rare-earth-based nanocrystalline high entropy oxides (HEOs) with fluorite structure types and average crystallite sizes between 6 and 9 nm will be presented. Their photocatalytic behavior towards AZO dye degradation and photoelectrochemical water splitting for hydrogen generation is examined in this research. 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 material successfully produces 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.