FKKT | UNIVERZA V LJUBLJANI
Fakulteta za kemijo in kemijsko tehnologijo

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

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z naslovom / title:

Tailoring photocatalytic materials for solar-driven oxidation/reduction of contaminants of emerging concern

v sredo, 12. 3. 2025 ob 15. uri
v predavalnici 1 v 1. nadstropju Fakultete za kemijo in kemijsko tehnologijo, Večna pot 113 ***/***
on Wednesday, 12. 3. 2025 at 15.00
in lecture room 1, 1st floor at the Faculty of Chemistry and Chemical Technology, Večna pot 113

Vljudno vabljeni! / Kindly invited!

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Abstract:

The most largely used semiconducting material in photocatalysis for both energy and environmental purposes, including water and air purification even at large scale, is titanium(IV) oxide (TiO_2), owing to its multi-faceted functional characteristics, such as chemical and thermal stability, resistance to (photo)chemical breakdown, amenable reactivity, and attractive mechanical properties. The current research aims are set at the improvement of semiconducting material properties regarding harvesting of abundant Solar irradiation and suppression of recombination rate of photogenerated charges (electron / hole (e^-)/(h^+) pairs), as well as reactor design enabling scale-up. The tailoring of semiconducting properties employing various strategies are in focus of this lecture.

In order to harvest a broader part of the solar spectrum, a key requirement to exploit visible light activation, various strategies have been adopted for TiO_2 (or similar semiconducting materials) structure-properties engineering, including modifications by incorporating metals (Fe, Cu, Co, etc.) or non-metals (N, S, C, P, etc.) into the crystal network or developing composite materials with other semiconductors ($BiVO_4$, g-C_3N_4, SnS_2, CuO, etc.) to synergistically exploit the advantages offered by the single components. Besides tailoring the band gap to increase harvesting of solar irradiation, the suppressing of e^-/h^+ recombination, and fine tuning surface properties (e.g. active area and defect content) are also highly required. The suppression of e^-/h^+ recombination and effective charge separation can be also achieved through various strategies by decorating semiconducting material surface with noble metals (Ag, Pd, Pt, Au, etc.) or by composites with (i) conductive polymers creating core-shell structures, (ii) graphene-like materials ((reduced) graphene-oxide), carbon nano-tubes or quantum dots, where the latter two also contribute to the increase of specific surface area.