



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

Prof. Per Hansson

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z naslovom / title:

**Drug-eluting polyelectrolyte microgels:
Microstructure and release mechanism**

v sredo, 22. 1. 2025 ob 15. uri
v predavalnici 1 v 1. nadstropju Fakultete za kemijo
in kemijsko tehnologijo, Večna pot 113 /
on Wednesday, 22. 1. 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!

Abstract:

Responsive polyelectrolyte gel networks are used in transarterial chemoembolization (TACE) to treat liver cancer. Upon administration to the hepatic artery, the gel acts as a sponge cutting off the blood supply to the tumour. In DEB-TACE, responsive drug-eluting beads (DEB) are filled with a chemotherapy drug. The embolization caused by the swelling of the beads during the release of the drug, prevents systemic spreading of the toxic drug, reducing side effects. In this talk I will present a recently proposed mechanism of the swelling/release process ('internal depletion-layer model') [1,2], highlighting the importance of the self-assembling properties of the chemotherapy drug and the electrostatic interaction between the drug and the polyelectrolyte network in the beads. In the first part of the talk, I will present the results from micropipette-assisted microscopy investigations of the DEB-TACE system DCbead® + doxorubicin hydrochloride (and related cationic drug molecules), together with the results from theoretical modelling of the release kinetics. In the second part, I will present the results from a detailed investigation of the model system sodium polyacrylate microgels + amitriptyline hydrochloride [3-5]. It will be shown how the drug molecules are organized on the microscopic level inside the microgels as revealed by small-angle x-ray scattering experiments. Based on that, it will be demonstrated how the interaction between the drug and the polyelectrolyte network causes phase separation in the microgel during loading and release of the drug, which in turn explains the internal depletion-layer mechanism. Finally, I will show that the proposed mechanism combined with a theoretical analysis of the diffusion-mediated release of the drug provides an accurate description of the swelling/release kinetics.

References

- [1] E. Ahnfelt, E. Sjögren, P. Hansson and H. Lennernäs, *J. Pharm. Sci.* 2016, 105, 3387
- [2] E. Ahnfelt, J. Gernandt, Y. Al-Tikriti, E. Sjögren, H. Lennernäs, P. Hansson, *Journal of Controlled Release* 2018, 292, 235
- [3] Y. Al-Tikriti, P. Hansson, *J. Phys. Chem. B* 2020, 124, 2289
- [4] Y. Al-Tikriti, P. Hansson, *Gels* 2022, 8, 4
- [5] Y. Al-Tikriti, P. Hansson, *Colloids and Surfaces A: Physicochemical and Engineering Aspects* 2024, 686, 133403