

PUBLIC LECTURE EVALUATION
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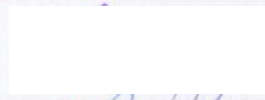



PŘEDNÁŠKA PRO ODBORNOU VEŘEJNOST

Mgr. Zdeněk Farka, Ph.D.

Photon-upconversion Nanoparticles as a Background-free Label in Single-Molecule
Immunosensing and Bioimaging

Brno 28.4.2022

Field of procedure: BIOCHEMISTRY

	Celé jméno	Podpis	Instituce
1.	prof. RNDr. Michaela Wimmerová, PhD.		Masarykova univerzita, PŘF a CEITEC
2.	prof. RNDr. Zuzana Bílková, Ph.D.		Masarykova univerzita, PŘF
3.	doc. Ing. Martin Mandl, CSc.		Univerzita Pardubice, Fakulta chemicko-technologická 

The public lecture “ **Photon-upconversion Nanoparticles as a Background-free Label in Single-Molecule Immunosensing and Bioimaging**” was given on-site at the Masaryk University Campus Bohunice, Building B11, room 2.05, and was also streamed on-line using MS Teams. The lecture attended 98 people on-site and additional 23 people followed the lecture on-line. The lecture was attended by four members of the habilitation committee and two reviewers:

prof. RNDr. Michaela Wimmerová, Ph.D. (chair, on-site)

doc. Ing. Martin Mandl, CSc. (internal member, on-site)

prof. RNDr. Zuzana Bílková, Ph.D. (external member, on-site)

prof. Niko Hildebrandt, PhD (international external member, on-line)

doc. RNDr. Lucie Korecká, Ph.D (reviewer, on-line)

Assoc. Prof. Tomasz Grzyb, Ph.D (international reviewer, on-line)

At the beginning of the lecture, the applicant introduced the field of biosensors and biosensing, focusing on bioaffinity and biocatalytic sensors, and turned attention to different recognition molecules, which might be used for sensor construction, including enzymes, antibodies or aptamers.

In the second part of the lecture, dr. Farka discussed the conventional immunosensors and their major application in the detection of microorganisms. He engaged auditorium attention especially by presenting the utilisation of immunosensors for detection of bioaerosols, potential biological weapons, and specific construction of the bioaerosol chamber and portable analysers.

In the last part of the presentation, he moved to the nanoparticle-based biosensors, describing main limitations in enzyme utilisation as the recognition elements of the biosensors. He showed a comparison of enzyme-linked and nanoparticle-linked immunosorbent assays, and the large space was devoted to the photon-upconversion nanoparticles (UCNP) in various analytical applications. Dr. Farka described the preparation of UCNP, their activation and conjugation of various molecules on their surface, and their practical utilisation. The important usage of UCNP was demonstrated, for example, in detection of *Melissococcus plutonius* bacteria, causing the crucial infections of honeybee larvae, therefore with a huge economic impact on honey production. The applicant also discussed the utilisation of UCNP in single-molecule detection, discussing the advantages and disadvantages of analogous and digital evaluations of the data.

After the talk, a long discussion about the topic was held, and applicant successfully answered all questions raised by the committee, the reviewers as well as the general audience.

Conclusion

The lecture delivered by **Dr. Zdeněk Farka** entitled “**Photon-upconversion Nanoparticles as a Background-free Label in Single-Molecule Immunosensing and Bioimaging**” and delivered as a part of the **habilitation procedure in the field of Biochemistry** clearly demonstrated that Dr. Farka is well established in the field of biosensors and is knowledgeable in this fast developing field. The lecture confirmed Dr. Farka’s pedagogical abilities to explain the topic also to people outside the field clearly.