Contribution ID: **133** Type: **Oral**

Engineering thermoresponsive polymer coating on plasmonic nanostructures for drug delivery applications

Friday, 17 November 2023 12:30 (15 minutes)

Drug delivery is a method of administering a drug to achieve a therapeutic effect in humans or animals [1]. Over the past two decades, many ways to create controlled drug delivery systems have emerged, among which systems based on plasmonic metals, particularly gold, stand out. Due to their bioinertness, ability to be heated under laser irradiation at different wavelengths depending on size and morphology, surface functionalization capabilities and ability to accumulate in tumors, gold nanoshells have become one of the best solutions for use in the fight against cancer cells.
The main idea of our investigation is to create a drug delivery system based on gold nanoshells covered by thermoresponsive polymer poly(N-isopropylacrylamide) (pNIPAM). When a near-infrared laser irradiates the nanostructure, gold heats up and polymer changes its structure from hydrophilic to hydrophobic, thus opening pores and releasing the loaded drugs outside. Using a specialized iniferter with SH- group for binding with metal makes RAFT polymerization much easier and with fewer stages.
By performing spectrophotometric measurements, it was found that application of iniferter to colloidal citrate-coated gold nanoshells leads to their aggregation and blocks pNIPAM synthesis. Alternatively, the creation of a thermoresponsive polymer layer simultaneously with the synthesis of seed silver nanoparticles was successful. As a result of performed studies, it was demonstrated that a thermosensitive polymer coating should be synthesized in a way to avoid the replacement of a stabilizing layer on plasmonic nanostructures, which would also reduce the complexity of the fabrication protocol.

---

1. Ward, M. A., & Georgiou, T. K. Thermoresponsive Polymers for Biomedical Applications // Polymers.-2011.-3(3).-P. 1215–1242.

Topics

Session D. Biomedical optics and sensors technology

Primary author: MARIIA, Khutko (V.E. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine)

Co-authors: LOPATYNSKYI , Andrii (V.E. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine); LYTVYN, Vitalii (V.E. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine); CHEGEL, Volodymyr (V.E. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine)

Presenter: MARIIA, Khutko (V.E. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine)

Session Classification: Emergent biosensing technologies