J.Heyrovský Institute of Physical Chemistry

How can plasmonic nanoparticles improve superresolution microscopy?

2 pm, Monday, September 3th 2018

J.Heyrovský Institute

Rudolf Brdička Lecture Hall

Dr. Vladimíra Petráková

Free University Berlin

Vladimíra Petráková is a Humboldt Fellow at Free University Berlin where she focuses on plasmonic enhancement of fluorophore emission and its applications for superresolution microscopy. She received her Ph.D. in Biomedical Engineering from Czech Technical University in Prague and Institute of Physics, Czech Academy of Sciences. During her Ph.D. and early postdoc she developed a method to control the color of fluorescence from the nitrogen-vacancy center of nanodiamond by alternating its surface chemistry and applied this method do visualize transfection and release of DNA in cells. At Free University Berlin she works in the group of Stephanie Reich and Helge Ewers.

Dr. V Petráková will describe possible routes to advance the resolution of optical imaging by enhancing the spatial separation and intensity of fluorescent probes using plasmonic nanoparticles. Our ability to understand how the structural organization of protein units translates into their biological function is limited by the techniques for observing protein structures in their natural environment. A most promising new technique for such studies is single molecule localization microscopy that overcomes the diffraction limit of optical imaging. But its current limit in resolution (10-20 nm) prevents the observation of single protein units with sufficient accuracy. The key to higher resolution is in brighter fluorophores and higher spatial separation of fluorophores. She will introduce plasmonic nanoparticles as tools to achieve both. By effectively focusing light into nanoscale volumes through their electromagnetic near-field, plasmonic nanoparticles enhance the absorption and emission of a molecule. Additionally, plasmonic enhancement leads to the shift in the projected position of the photon emitted by the fluorophore, creating an image that no longer corresponds to the fluorophore original position. A system based on DNA origami will be described that exploits this shift in detected position as a way to expand the projection of the sample structure and further increase resolution.