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Ultrafast photoemission from plasmonic nanotriangles and applications

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Ultrafast photoemission proved to be a versatile tool for probing the field enhancement of nanoplasmonic near-fields in the vicinity of nanostructured metal surfaces. Since this new method can be further developed to enable pump-probe studies of nanoplasmonic fields, it is particularly interesting to investigate ultrafast plasmonic photoemission with few-cycle laser pulses, on the characteristic timescale of typical collective plasmon phenomena. To this end, we induced photoemission from different plasmonic nanoparticles with a state-of-the-art Ti: sapphire oscillator, delivering 5.5 fs pulses in a carrier-envelope phase-stabilized manner. The yield, the kinetic energy spectra and angular distribution of photoelectrons were analyzed with the help of a hemispheric electron spectrometer. Ongoing experiments seek to answer whether photoelectron movement on nanometer scale can be governed by the waveform (i.e. the carrier-envelope phase) of few-cycle laser pulses. To this end, asymmetric nanostructures (with respect to the polarization direction of the laser) look the most promising so that the symmetry of the photoemission from the hot spots of the nanoparticles is broken. First, we investigated the kinetic energy spectra of the photoelectrons from nanotriangles with 1-kHz, 40-fs 800-nm pulses delivered by a regenerative amplifier. In this case, a time of flight (TOF) spectrometer can be used for this purpose and after this kind of validation of the field enhancement on the new sample, we can perform the experiments aiming to steer the photoelectrons with the carrier-envelope phase (CEP) of few-cycle laser pulses using an 80-MHz, 5.5-fs 730-nm CEP stabilized laser.

Biography

Benedek J Nagy has completed his MSc in Physics at the Budapest University of Technology and Economics in 2014. He started his PhD at the University of Pécs and he is currently an Assistant Research Fellow at the Wigner Research Centre for Physics in the MTA "Lendület" Ultrafast Nano-Optics Group. He spent eight month at the University of Oldenburg in the Ultrafast Nano-Optics Group as a Guest Researcher. He has published more than five papers in reputed journals and was Author and Co-Author to several conference papers.

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