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Metal grating coupling with different nanoparticles for highly intensified SERS response

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The systematic research of structures with gold and silver nanoparticles (MeNPs) of various shapes and dielectric functions immobilized onto the silver grating is performed. These structures may serve as double resonance SERS (Surface-enhanced Raman spectroscopy) substrates with coupling between surface plasmon polariton (SPP) supported by the silver grating and localized surface plasmons (LSPs) excited on the grafted metal nanoparticles (MeNPs). The silver grating supports SPP excitation under the 785 nm wavelength illumination. Spherical silver and gold nanoparticles, triangular silver nanoprisms and gold nanorods are prepared and used with the aim to gradually cover the LSP excitation in the 400-800 nm wavelength range. MeNPs are grafted through the 4,4'-biphenyldithiol (BFDT) linkers. Rhodamine 6G (R6G) molecules are added onto SERS substrates and located above and between the MeNPs. Our experimental and theoretical results exhibit that the enhancement can be explained by multiple couplings between the MeNPs, as well as between the Ag film and MeNPs. LSP-SPP interplay leads to the plasmon focusation in the different volumes (between MeNPs or between the MeNPs and silver grating). Several wavelengths (470, 532, and 785 nm) are applied to probe the SERS response. Depending on the nanoparticles type and excitation wavelength a significant SERS signal is produced by R6G or BFDT molecules.

Biography

Kalachyova Yevgeniya is a PhD student at the University of Chemistry and Technology, Chemical Engineering, Prague, Czech Republic, on the topic, "Preparation of polymer optical metamaterials" from 2012 – present. She did her Internship at University of Memphis, Department of Chemistry Tennessee, USA, from May - June 2011. She did her Master's degree in Natural Science, Scientific & Pedagogical direction, at Al-Farabi Kazakh National University, Almaty, Kazakhstan, GPA: 3.96/4.00 in the year 2009 – 2011. She is did her Bachelor degree in chemistry, with honours Al-Farabi Kazakh National University, Almaty, Kazakhstan, in the year 2005 – 2009. She has published more than 10 papers in reputed journals.

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