SILVER-TIN OXIDE NANOPARTICLES FOR SHELL ISOLAITED NANOPARTICLE ENHANCED RAMAN SPECTROSCOPY

Vytautas Taurelė[1], Tatjana Charkova[2]

[1]Vilnius University
[2]Center for Physical Sciences and Technology
vytautas.taurele@chgf.stud.vu.lt

Silver nanoparticles (Ag NPs) are suitable for constructing devices of optic, electronic, solar, etc. systems. The anti-pathogenic properties also make them attractive as diagnostic tools in medical sciences and environmental protection [1]. Any successful application requires modification of the silver surface. Different coatings (polymers, graphene, transition metals, etc.) prevent aggregation and degradation of Ag NPs and also solve potential biocompatibility issues. Ag core-shell systems are widely used in shell-isolated nanoparticle-enhanced Raman spectroscopy (SHINERS) [2]. Such nanoparticles scattered on the analyzed surface act as small amplifiers of the Raman signal. As a result, informative spectra of the analyte can be recorded (see in fig.).

Tin oxide is a promising protective coating as it is stable over a wide pH range, making Ag core-SnO_2 shell nanoparticles (Ag/SnO_2 NPs) convenient to use. This work reports the synthesis of up to 80 nm Ag/SnO_2 NPs coated with up to 10 nm of SnO_2. The Ag/SnO_2 NPs are appropriate for SHINERS experiments, and the SnO_2 shell is thick enough to prevent nanoparticle aggregation and preserve Raman signal intensity.

[1] W. J. Stark, P. R. Stoessel, W. Wohlleben, A. Hafner, Industrial applications of nanoparticles, Chem. Soc. Rev. 44 (2015) 5793–5805. https://doi.org/10.1039/c4cs00362d

[2] J. F. Li, Y. J. Zhang, S. Y. Ding, R. Panneerselvam, Z. Q. Tian, Core-shell nanoparticle-enhanced Raman spectroscopy, Chem. Rev. 117(7) (2017) 5002–5069. https://doi.org/10.1021/acs.chemrev.6b00596