COLLOIDAL SERS SPECTROSCOPY OF BIOLOGICAL FLUIDS

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Vibrational spectroscopy is known to be a reliable technique for qualitative and quantitative chemical analysis of various biological fluids. Such analysis is rather efficient when molecular compound under study is present in the fluid with high concentration. There are many cases when determination of compounds at extremely low concentration is needed. Such cases include detection pharmaceuticals or their metabolites in blood, detection of cancer cells in biological fluids, etc. In such situations conventional vibrational spectroscopy techniques - infrared absorption and Raman scattering are not suitable due to too low sensitivity, therefore other more sensitive spectroscopic methods have to be used. This work presents some applications of colloidal SERS spectroscopy for the detection of medicine metabolites in blood and for detection of various cancer related chemical substances in intracellular and extracellular fluids. Various gold and silver nanoparticle colloidal solutions were used for the implementation of SERS spectroscopy and the best ones (giving the highest enhancement with the least interference to the spectra) were determined. We conclude that the SERS approach can be applied for screening of pharmaceuticals and drug usage. In case of aspirin consumption, the detection limit was found to be down to mild toxicity. Such approach also allows detection of cancerous tissue areas and, therefore, can be used during surgical operations for exact determination of tumour boundaries.