Title: Electrochemical preparation of Ag- and Au-based plasmonic platforms
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Abstract

Plasmonic-based sensors are valuable tools in studying molecular interactions and label-free detection in real time to mention just a few examples. Used setups are relatively simple and can be miniaturized and integrated. Their crucial element is the sensing platform. This dissertation was focused on the fabrication of Ag- and Au-based platforms showing a narrow plasmon resonance peak in the UV-Vis spectrum and high refractive index sensitivity for use in localized surface plasmon resonance (LSPR), and/or a high enhancement factor for use in surface enhanced Raman spectroscopy (SERS). The fabrication method of choice was electrodeposition. It allows the growth of particles of specified size, shape and properties in a very precise and cheap manner. Potentiodynamic methods were chosen, specifically cyclic voltammetry, to grant the possibility of tuning the number of nucleation and growth steps (with the number of cycles used) as well as the relaxation time of the system (with changing the scan rate). The use of the environmentally-friendly reducing agents, as citrate ions and glucose, was preferred because of their harmlessness and lack of reports about usage in potentiodynamic methods.

A broad range of applications of obtained platforms in plasmonic methods was shown. Fabricated platforms exhibited very high SERS enhancement factors (EF) therefore it was possible to record SERS spectra of neurotransmitters in physiologically relevant concentrations. In the field of LSPR it was possible to study molecular interactions with lectins-to-sugars binding. Also, developed platforms were sensitive enough to sense the difference in dielectric coefficient between Gram-positive and Gram-negative bacteria. Moreover, it was possible to differentiate bacteria according to their viability. As last, the proof-of-concept of a biosensor was shown, where T7 bacteriophages were recognized with specific antibodies covalently bound to the platform.