Chapter 28

Metal-Enhanced Fluorescence in Plasmonic Waveguides

Alexandre Grégoire and Denis Boudreau

Abstract The field known as plasmonics has seen a tremendous growth in interest from the research community. One of the more popular topics is the surface plasmon waveguide. As an alternative to solid linear nanostructures, a chain of plasmonic nanoparticles can also be used to propagate a traveling wave of surface charges. Experimentally, plasmonic nanoparticles lend themselves well to the fabrication of plasmonic waveguides via the self-assembly of nanoparticles into linear structures with very small inter-particle separation. In the present work, we used wrinkled PDMS stamps to fabricate large (i.e., several microns in length) one-dimensional nanoparticle assemblies. Combining this technique with the use of tunable, metal-dielectric, core-shell nanoparticles [1] allows the fabrication of linear assemblies with adjustable inter-particle separation. The observation of isolated nanoparticle assemblies by single particle microscopy/spectroscopy (epifluorescence, dark-field scattering, fluorescence lifetime microscopy) and scanning electron microscopy allows us to gather optical and structural information in order to derive interesting structure-properties correlations – in particular the interaction between propagating dark plasmons with the emission behavior from nearby fluorophores.

Reference

1. Asselin, J., Legros, P., Grégoire, A., & Boudreau, D. (2016). Correlating metal-enhanced fluorescence and structural properties in Ag@SiO₂ core-shell nanoparticles. *Plasmonics*, 5, 1–8.

A. Grégoire (✉) • D. Boudreau
Département de chimie et Centre d'optique, photonique et laser (COPL), Université Laval,
Québec (QC), G1V 0A6, Canada
e-mail: alexandre.gregoire.1@ulaval.ca