

Prion Detection Through Organized Arrays of Gold Nanorods as SERS Substrates

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Name of Fellow

Institution

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Contact information of fellow

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Prion Detection Through Organized Arrays of Gold Nanorods as SERS Substrates

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The project/programme is most relevant to:

Prion disease

Keywords

Amyloid Proteins | Supercrystals | Prionic diseases | SERS | Plasmonic nanoparticles | Self-assembly | Detection | Diagnosis.

Research Abstract

This proposal aims the design of novel optical enhancers for surface-enhanced Raman scattering (SERS) to develop routine methods for quantitative detection of a very broad range of substances based on regular arrays of gold nanorods. As proof of concept the diagnosis of

neurodegenerative diseases, such as Alzheimer or Creutzfeldt-Jakob diseases (CJD), which still pose a great challenge for international health systems because of the economic and social impact of its pandemic outbreaks. Such diseases do not induce any immunological response on the infected individuals and thus, antibody detection cannot be used because they are not produced by the host. Therefore, antibody-free detection systems are required, which are also highly sensitive and selective. Overall this presents a significant challenge which can be resolved using a new generation of SERS substrates with unprecedented degree of structural control.

Therefore, the main objectives of the project will involve the fabrication of uniform gold nanorods within a wide range of sizes; their assembly into perfectly ordered supercrystals, both on planar and patterned substrates; evaluation of the SERS enhancing properties of such assemblies as a function of nanorod morphology and degree of order; comparison with theoretical modeling and prediction of the most convenient configuration; and finally the full implementation of the detection of prions using these substrates. We propose the use of SERS as a non-invasive sensor, which is able to detect and monitor prions in biological fluids (blood, urine or saliva). For this target to be achieved, the enhancing metallic substrates need to be engineered for focalization of the plasmonic modes at certain regions of the substrate and production of extremely high enhancement factors. This idea is based on the concept of field localization by nanoantennas, which will be perfectly applicable to the oriented gold nanorod colloidal crystals.

Types:

Fellowships

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Prion disease

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