Master thesis project – 30 hp

Nanofabrication of coated magnetite nanoparticles for biophysics investigations of bacterial spores

Project Goals

1. Conduct nanoparticle synthesis to produce nanoparticles of a consistent size and shape
2. Verify produced nanoparticle properties and determine optimal production methods
3. Manipulate nanoparticles using the Laser Tweezers Raman Spectroscopy system
4. Characterise the efficiency of nanoparticle binding to the spores under various conditions

Background

Nanoparticles are particles with a diameter of 1-100 nm with different material compositions, shape and surface properties. An emerging field of application of nanoparticles is in the biophysical sciences, with applications ranging from drug delivery, to decontamination and to bacterial detection.

Of particular interest is the ability of nanoparticles to disrupt bacterial spores, resilient seed-like forms of bacteria that can resist physical and chemical stresses, including temperatures of over 100 °C. Spore ability to stay dormant for years is a challenge for healthcare, while and the danger from some spore forming organism (such as anthrax) and high decontamination cost makes them suitable as biological warfare agents.

As such, development of optimised nanoparticles can help greatly reduce the costs associated with hazardous spores.

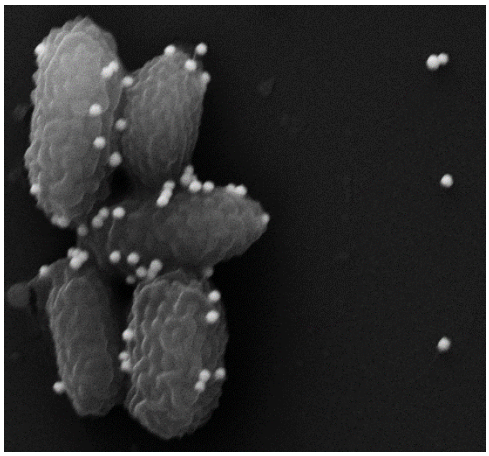

Figure 1. Example of gold nanoparticles on the surface of a bacterial spore, disprupting the spore and enabling rapid detection.

Your Background

You enjoy experimental work

You are familiar with chemistry

You understand optics

You are creative in your work

Equipment avalaible

All the chemical reagents for nanoparticle sysnthesis and the experimental tools for this work are available. If any more are needed to explore research ideas, we can buy them.

Contact infromation

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