Greener and cleaner biosynthesis of gold nanoparticles using echo-friendly yeast

Lead supervisor: Dr Walid Omara

Co-supervisor(s): Dr Philip Gardiner

School/Institute: Biosciences and Chemistry

Contact for applicant queries: Dr Walid Omara w.omara@shu.ac.uk

Project summary

This project explores the potential of yeast as a sustainable and eco-friendly platform for the biosynthesis of gold nanoparticles (AuNPs). By varying gold concentrations and substrates, we aim to assess the impact of these parameters on yeast viability and nanoparticle production. The project will optimise yeast growth conditions to enhance nanoparticle yield and consistency.
Characterisation of the synthesised AuNPs will be performed using advanced analytical techniques, such as UV-Vis spectroscopy, dynamic light scattering (DLS), and electron microscopy.
In addition to nanoparticle characterisation, this research will investigate the metabolites released in the media and volatile compounds in the headspace during biosynthesis. This metabolomic profiling will provide insights into the biochemical processes involved. Furthermore, key genes implicated in nanoparticle biosynthesis will be identified, and their expression levels will be analysed using techniques such as quantitative PCR or RNA sequencing.

The internship offers a hands-on opportunity to develop valuable skills in microbiology, nanotechnology, and molecular biology. Applicants will gain experience in:

- Yeast culturing and optimisation of growth conditions.
- Nanoparticle synthesis and characterisation techniques.
- Analytical methods for metabolomics, including chromatography and mass spectrometry.
- Molecular biology techniques for gene expression analysis.

This internship is part of a larger research initiative aimed at developing yeast-based platforms for green nanotechnology. The intern's defined contribution will focus on optimising growth conditions, performing nanoparticle characterisation, and assisting in gene expression analyses. This work will provide critical data to better understand the interplay between yeast metabolism and nanoparticle synthesis, contributing to the broader goals of sustainable nanotechnology development.

Specific skills and experience required for this project

Please also refer to the advert on our jobs pages for the person specification for these internships

Applicants for this project should demonstrate the following skills and knowledge

1. Basic Laboratory Skills: Familiarity with aseptic techniques, pipetting, and general microbiological practices.
2. Background in Biosciences or Chemistry: Knowledge of microbial systems, biochemistry, or nanotechnology, with an understanding of fundamental concepts in metabolism and gene expression.
3. Analytical Thinking: Ability to interpret scientific data and troubleshoot experiments.

4. Enthusiasm for Research: Interest in sustainable technologies, nanomaterials, and molecular biology.
5. Communication Skills: Ability to document experiments, analyse results, and contribute to discussions within a research team.

Desirable Skills (not mandatory but advantageous):

- Experience with yeast culture or other microbial systems.
- Basic knowledge of nanoparticle synthesis or characterisation methods (e.g., spectroscopy or microscopy).
- Familiarity with molecular biology techniques, such as PCR or RNA analysis.
- Prior experience in metabolomics or related analytical methods.

Additional Requirements:

- Willingness to learn and apply new techniques independently and collaboratively.
- The project does not require travel but may involve extended laboratory hours for specific experiments.

This project is designed to support the development of research skills and enhance readiness for postgraduate study, so prior extensive experience is not required. Applicants with a strong motivation to learn and grow in an interdisciplinary research environment are encouraged to apply.

Project location

City Campus

Project delivery

This project would preferably be delivered on a full-time basis. Part-time arrangements may be considered, with a minimum commitment of 3 days per week.