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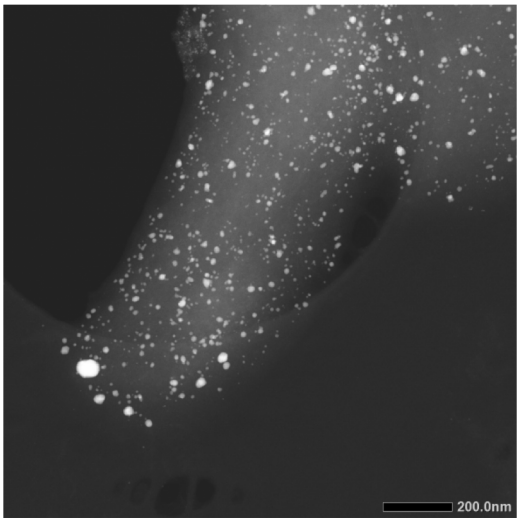
Biosynthesis of bimetallic nanoparticles for fine and specialty chemical production

"This award provided a quick, convenient and effective route to bring together the Manchester group's expertise in bioproduction of metal particles with Johnson Matthey's catalysis know-how. We have begun to determine the potential of this technology for the production of novel catalysts." Nigel Powell, Johnson Matthey

Jon Lloyd and Richard Kimber, University of Manchester; Nigel Powell, Johnson Matthey plc

RESULTS: Building on from a successful Business Interaction Voucher project with Johnson Matthey, we continued to investigate the biosynthesis of novel bimetallic nanoparticles for fine and specialty chemical production. Electron microscopy revealed that different metals have varying affinities for forming bimetallic nanoparticles and that the bimetallic nature is also affected by the order the metals are supplied to the bacteria. In addition, we found that the pH buffer used during synthesis can exert some control over the formation of the bimetallic nanoparticles. This knowledge will help us tailor these products going forward. Several of the biosynthesised nanoparticles showed promising catalytic activity. Although they did not perform to the same level as a commercial catalyst, this project has provided us with valuable insights into the optimisation of these bionanocatalysts which we are continuing to explore.



Electron microscope image of bacteria that contain bimetallic nanoparticles. Image provided by G. Goodlet, Johnson Matthey Technology Centre.

INITIAL AIMS: Metal-reducing bacteria are able to recover a wide range of metals from process environments as catalytically active nanoparticles. This project will produce bimetallic nanocatalysts for use in fine and speciality chemical production. Bimetallic nanoparticles offer advantages over monometallic catalysts due to the properties that arise from the presence and synergy of the two metals, offering increased efficiency and specificity for speciality chemical production. This novel biotechnological process offers a simple, cost-effective, environmentally friendly synthesis route for bimetallic catalyst production.

- **The partners will continue to work together to optimise and tailor the catalytic activity of these materials**
- **We will then seek to identify potential avenues for further funding**