UNIVERSITY OF BIRMINGHAM

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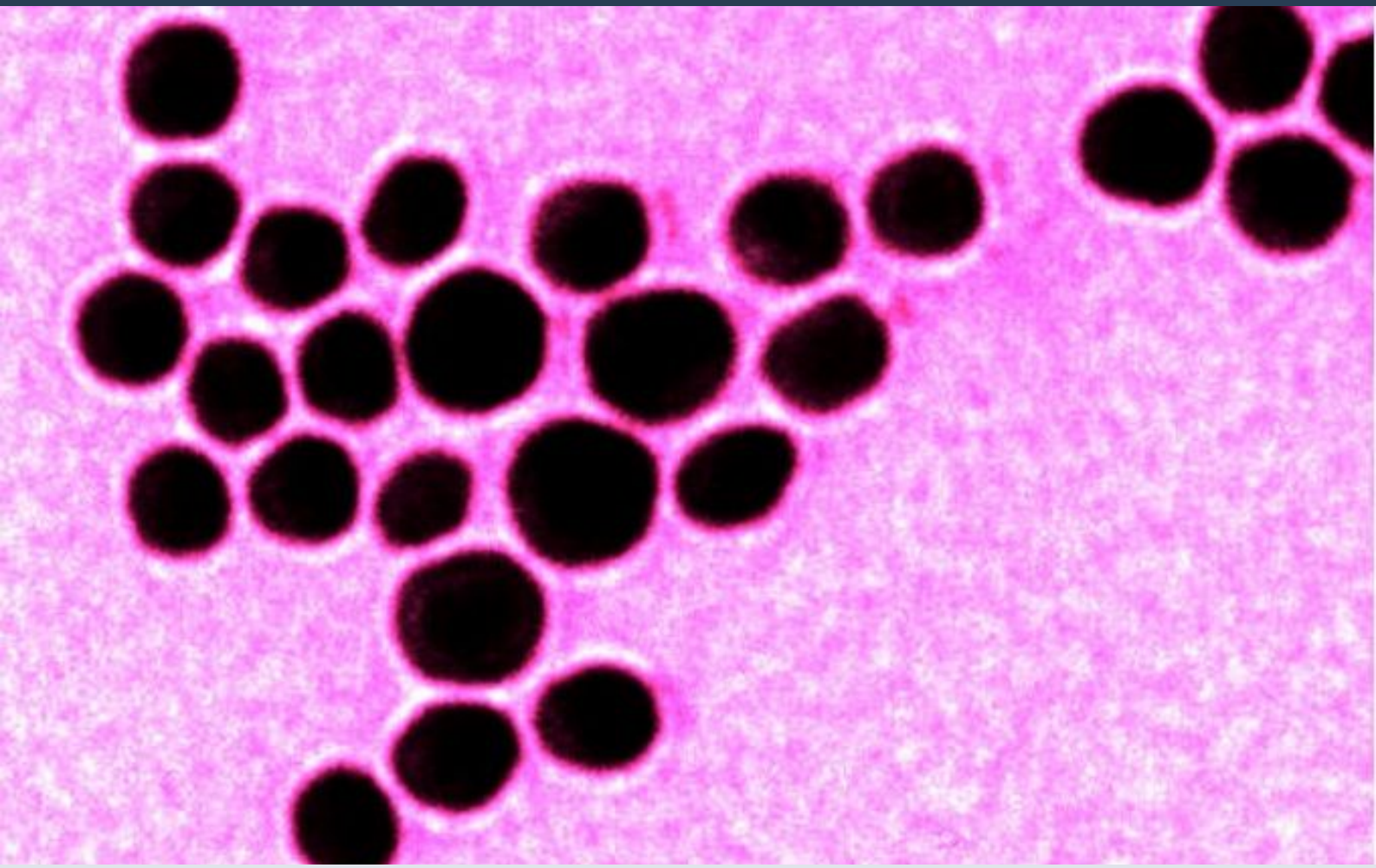
Metal Nanoparticles for Tissue, Cell and Materials Imaging

A new method for attaching metal complexes to nanoparticles allowing a high loading of luminescent or MRI probe materials.



IP Status

Patented

Seeking

Licensing, Development partner

About **University of Birmingham**

At the University of Birmingham our research leads to new inventions and fuels innovation and business growth.

Background

Imaging information at the nanoscale can lead to breakthroughs in healthcare and material development. There is a need for probes that provide spatial resolution in a variety of different imaging modalities and target specific bio-chemicals, tissues or diseases. Current imaging compounds are limited in multimodal use due to their synthetic complexity. Most of the organic based probes suffer from lack of photo-stability, short luminescence lifetimes and narrow wavelength separation between excitation and detection light; the latter brings serious limitations in imaging with interference of scattering light close to excitation source.

Tech Overview

A new method has been developed for attaching metal complexes to nanoparticles for imaging cells and tissues and other studies in materials science. This approach allows a high loading of luminescent or MRI probe materials on the nanoparticles providing nanoprobes with strong signal output. Attachment of targeting agents on the nanoparticle is also possible allowing mixed modality use. Cell imaging has been undertaken using epi- and confocal luminescence microscopy as well as transmission electron microscopy.

Nanoparticles based on noble, inert metals such as gold and platinum can act as scaffolds for attachment of multiple probes, not only to increase signal output but also to bring several modalities attached to a single particle. Metal probes are particularly attractive for their luminescent, redox and MRI properties.

Current methods for producing nanoparticles have problems with mono-dispersity, water solubility or size, which can affect functions such as cell uptake or detection by imaging techniques. The coating of gold and platinum nanoparticles is a reliable way of controlling size and loading of the probe. Coating with luminescent metal complexes is attractive for biological applications for several reasons including emission in the visible, suitability for biological samples and photo-stability. However, metal complexes are usually positively charged and attempts to attach them to gold nano-particles leads to agglomeration of the particles. This new method of attachment causes no agglomeration of the particles and at the same time allows efficient loading. Further studies continue to explore the utility of these materials.

Benefits

- Attachment of metal complexes on nanoparticles is now possible, mediated by commercially available materials.
- Metal coated nano-particles are highly luminescent and has been demonstrated with red, green or orange emitters.
- These novel nano particles can be characterised with different techniques including spectroscopy and microscopy.

- The particles may also be useful for labelling tumours, making the tumours easier to target with radiotherapy.

Applications

These nanoparticles can be employed as part of the reagent system in immuno-assay development, and also in medical imaging. The particle can potentially act as a carrier with the ability to penetrate micro-tubules in tooth structures and deliver dental active ingredients, and could have the ability to deliver long lasting anti-bacterial ingredients in household products such as laundry detergents.

Opportunity

Seeking development partner to licence and support development of a market specific product in any of the markets detailed above. Licences may be granted giving either market sector or geographic exclusivity.

ZSR816

Patents

- Patent granted in Europe as EP 2726187 on 27th September 2017 (country validations pending)
- Patent granted in the USA as US 9,683,004 B2 on 20th June 2017