

## *Metal particles on solid substrates*

Current technologies to organize nano particles into controlled architectures on surfaces are based on synthesis of these particles using wet chemistry (solution based) followed by their functionalisation and their absorption on the surface by a self-assembly process. These current production methods are cheap and easy to perform but with several disadvantages:

- The process is too long (sometimes several days) involving many steps
- The deposition of particles on the surface and their uniformity is hard to control and leads to uncontrolled particle aggregation
- Instability of fabricated particle arrays on surface.

To address some of these problems several methods for direct synthesis of nano particles on surface were recently explored including: electrochemical deposition, gas-phase synthesis and fabrication using porous templates. These methods combine synthesis and assembly of nano particles on the surface into one step, but unfortunately some of them require special and very expensive equipment.

## Technology Overview

The technology has been developed by Dr Dusan Losic at the University of South Australia's Ian Wark Research Institute and adds value to existing applications by integrating with existing technologies. The present invention describes the process of fabrication of an array of metal particles on solid surfaces. The method is template free and wet chemistry free. This enables in situ fabrication and surface tailoring of a range of nanoparticle arrays including metals, metal alloys and metal oxides with

range of sizes from 50 nm to several microns.

The nano particle formation process on solid surfaces can be applied to a range of substrates. The invention is not focused on a particular application and studies into the development of practical devices are currently in process. Fabrication protocols are tested on a range of substrates including silicon wafers, quartz glass, transparent porous alumina and biological substrates such as diatom biosilica.

The ability to improve consistency and stability of nano particles and arrays will give companies significant competitive advantage in terms of product quality and service life.

## Application

### 1. Biomedical diagnostics

Gold nano particle arrays for detection of a variety of biomolecules are important for disease diagnosis, drug discovery, and those associated with bioterrorism and warfare. Both electrochemical, optical detection of DNA hybridisation and proteins could be applied successfully. Commercial applications for protein and DNA gold nanoparticle systems are already being realised and this technique has the capability to provide superior nano particle platforms and improve quality of fabricated units.

### 2. Other potential applications

The emerging disciplines of nano devices, which employ and have potential to employ nano particle arrays include: super hard materials, super fast computers, magnetic recording devices, plasmon waveguides, dirt repelling surfaces,

new cancer treatments, highly sensitive and selective sensing devices, environmentally friendly fuel cells, solar cells, highly effective catalysis, platform for growth of semi conductive nano wires and carbon nano tubes.

## Benefits

The process offers the following advantages:

- Solution free and template free method of formation of nano particles
- Allows access of nano particles on demand large number of metal and metal oxide particles including their alloys
- The particle size and uniformity including formation of different sized particles can be easily controlled
- Simple, easy to use and time effective methodology
- Superior quality of particle arrays with better fixation of particles on surface, robust array with superior thermal and chemical stability
- Process has the versatility to perform a large range of surface modifications and functionalisation of particles on surface.

## Market

The potential market of this invention can be assessed in two ways:

- a) by replacing the existing nanoparticle platforms used in commercial products or devices that are fabricated by solution-based technologies
- b) by application of these platforms using different nanoparticle materials and their properties for development of new products and devices.

## Investment Opportunity

We are interested in talking to businesses who see potential in nano particles formation procedures and quality of these particles for various applications. Our aim is to develop this technique further. A wide range of Intellectual Property and commercialisation rights can be explored at this stage of project development.

## IP Position

The Intellectual Property is protected by a patent application.

## The Group

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