

SELF STANDING NANOPARTICLE NETWORKS/SCAFFOLDS WITH APPLICATIONS IN DRUG DELIVERY, TISSUE ENGINEERING, CATALYSIS ETC.

NCL Innovations: Solutions from CSIR India

## Technology

- A novel process of preparing self standing, crosslinked networks (scaffolds)
  of nanoparticles from commonly available materials as
  - Metalllic particles
  - Inorganic particles
  - Organic and polymeric compounds
  - Semi conducting and magnetic particles
- Scaffolds have controllable mesh size
  - Pore size ranges from 500 nm to 1 mm (nano to micro porous)
  - Particle volume fraction is between 0.5 to 50%
- Directionality of the pore formation can also be precisely maneuvered
- Has a wide range of applications in various areas



## **Applications**

- Drug delivery- Inorganic/organic delivery scaffolds for Nitric Oxide- an important bioregulatory agent
- Tissue engineering- Cell seeding scaffolds
- Proposed applications of scaffolds
  - Cell growth substrate
  - Materials for solar cells
  - Electrical/thermal insulators
- Catalysis- Catalyst support for small sizes available for diffusion of reactant molecules
- Metamaterials\*- Electromagnetic devices- ideally gold nano particles
- Electronic devices
- Chromatography

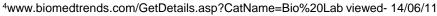


<sup>\*</sup>A meta material is a substance that derives its electromagnetic properties from its structure rather than from its chemical composition.

### Market Potential

- The market for nanomaterials in the US alone was estimated to be around \$1.4 billion in 2008<sup>1</sup>; the demand for nanomaterials is projected to grow at an impressive 21% per year till 2013<sup>2</sup> indicating a significant market potential
- Metamaterials had a European market size of EUR 133 million in 2007 and are expected to grow to EUR 2.1 billion in 2013, at a compound annual growth rate (CAGR) of  $26.5 \%^3$
- The global market for drug delivery has been projected to exceed \$57
  billion by 2012<sup>4</sup>

<sup>&</sup>lt;sup>3</sup>Nanostructured Metamaterials Exchange between experts in electromagnetics and material science- Report, Pg 3. (http://ec.europa.eu/research/industrial\_technologies/pdf/brochure-metamaterials\_en.pdf)- viewed 03/06/11





<sup>&</sup>lt;sup>1</sup> http://www.freedoniagroup.com/Nanomaterials.html viewed 01/08/11

<sup>&</sup>lt;sup>2</sup> http://www.freedoniagroup.com/World-Nanomaterials.html viewed 01/08/11

#### Value

- Generic production procedure
- Can be prepared from readily available materials
  - Metallic particles such as gold
  - Inorganic particles such as silica
  - Organic and polymeric compounds
  - Semiconducting and magnetic particles
- Can be formed in to ordered, structured phase, lamellar, spongy, cubicpreferably hexagonal network
- Has a precisely controllable directionality and pore size



## Technology Status, IP Status

- Patent application filed
- Demonstrated at lab scale
- Ready to be licensed/commercialized



#### Links & References

- Self-Standing Three-Dimensional Networks of Nanoparticles With Controllable Morphology by Dynamic Templating of Surfactant Hexagonal Domains (2011) Chem. Mater., 23 (6), 1448–1455
- Draper, M. et al. (2011) Self-Assembly and Shape Morphology of Liquid-Crystalline Gold Metamaterials, Adv. Funct. Mater., 21, 1260–127.
- Patent application
  - WO2010070679

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# Summary

Technology Summary	
Technology title	Self standing nanoparticle networks/scaffolds with applications In drug delivery, tissue engineering, catalysis etc.
Industry /sector	Pharmaceuticals, tissue engineering, advanced materials
Year of development	2009
Related patents (with links)	Patent application filed
Technology readiness level	Demonstrated at lab scale
Licensing status	Ready to be licensed /commercialized
Encumbrances	None
Availability	Yes

