

Solutions for Industry & the Environment Case Study: NanoCourier – Layered Double Hydroxide (LDH)

Researchers at the ARC Centre of Excellence for Functional Nanomaterials have developed a method to prepare layered double hydroxide (LDH) particles of controlled and narrow particle size distribution (Figure 1 right). The novel method also prevents the aggregation of the particles therefore facilitating the formation of a clear suspension (Figure 2 below top).



- The ARC Centre of Excellence for Functional Nanomaterials is headquartered at The University of Queensland, with centre nodes at the University of New South Wales, Australian National University and the University of Western Sydney.
- Over 100 centre researchers, led by Professor Max Lu, an internationally recognised expert in nanomaterials, together with the state of the art facilities provide cutting edge technology development and services tailored to the very needs of your industry.

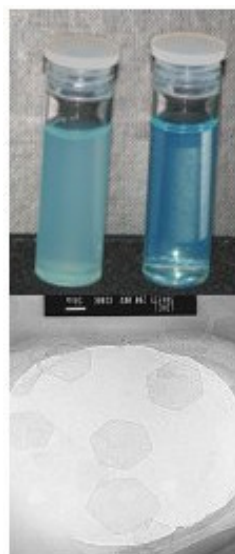
The Centre aims to

- carry out world-class research at both fundamental and applied levels into the synthesis, characterisation and application of various nanomaterials;
- provide first class research training contributing to the growth of Australia's human capital; and
- establish close research linkages with leading international groups, positioning Australia as a world leader in this emerging field. The programs will lead to innovative techniques and technologies that will underpin new materials and products for applications in clean energy, environmental, and health care industries.

<http://nanotechnology.org.au>

Australian Nanotechnology Alliance Limited
A.C.N. 45 120 844 224

PO Box 609
Hamilton QLD 4007
(T) 07 3216 4717
(F) 07 3216 4017
(E) info@nanotechnology.org.au



LDH is plate-like (Figure 3) mixed metal hydroxide particle that through ionic attraction forms layered or sandwich like particles. The outer cationic LDH plate with their excessive positive charge has interlayer anions to balance the ionic charges.

LDH is commonly used in a variety of applications and products including catalysis, anion exchange, polymer-LDH nanocomposites and a range of clinical usage.

Control of the LDH particle size, bulk morphology and stability in suspension with the NanoCourier technology allows LDH nanoparticles to be coated onto new materials. This would lead to the development of improved and new products that depend on the key chemical properties of layered double hydroxide.

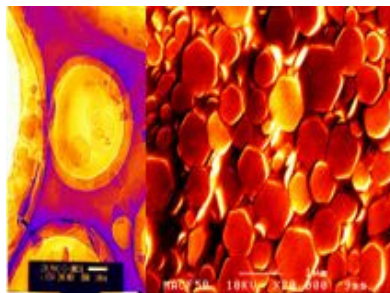
Industry Applications and Market for the NanoCourier

The NanoCourier has potential applications in a number of markets, including the following:

- *Drug Delivery:* LDH particles are the basis of antacid and antipepsin agents and therefore have a long history of safe human oral administration. The control of LDH particles and morphology which is possible with the NanoCourier technology can enhance control of delivery and release of drugs and DNAs by injection.



- *Cosmetics*: NanoCourier can provide controlled release of vitamins and minerals in facial and other cosmetic creams for example enabling “all-day” moisturising.
- *Materials*: NanoCourier can be used as dispersed fillers in nanocomposite such as polyurethane to improve properties including strength, thermal stability and flammability (LDH is a common flame retardant). NanoCourier can also be used as coatings in membrane for gas and liquid separation.
- *Water Treatment Products*: The technological advantages of the NanoCourier can allow the development of new materials for removing pollutants, such as arsenic and anionic toxins from water and wastewaters.
- *Analytical/Diagnostics*: NanoCourier can be used to develop devices for the detection of select chemicals in water treatment and other chemical processes



UniQuest Pty Ltd
Dr Fouad Haghseresht
Level 7 GP South Building
Staff House Road
University of Queensland
ST LUCIA QLD 4072
Phone: 61 7 3365 4037
Fax: 61 7 3365 4433
Email:
f.haghseresht@uniquest.com.au

<http://nanotechnology.org.au>

Australian Nanotechnology Alliance Limited
A.C.N. 45 120 844 224

PO Box 609
Hamilton QLD 4007
(T) 07 3216 4717
(F) 07 3216 4017
(E) info@nanotechnology.org.au