Trinity College Dublin

Phase-Transfer Reactions

A new method of initiating reactions and preparing micro- and nano-structures

Basic overview

(Entrepreneurship)

Research

Innovation

SUCCESS

Interaction

This technology offers new approaches for initiating phase transfer reactions using an external magnetic field. This invention enables development of new composite materials by using magnetically assisted trans-phase reagent delivery and also allows magnetically triggered reaction initiation or catalysis polymerisation, condensation, etc.) (e.g. at aqueous/organic interfaces.

Dedication

Inspiration

In this approach **magnetic particles are used as catalysts or reagent carriers**. The magnetic properties enable control of physical manipulation and migration of the particles across different phases using an external magnetic field (e.g. a permanent magnet). This triggers the required trans-phase reaction or process.

Transmission electron microscope images demonstrate nanoparticles before and after coating with a layer of photoactive titania resulting in core-shell nanowire structures for photocatalytic applications.



Before: Magnetic nanoparticles.



titania coated nanowires have been prepared.

Advantages

This **one-step**, **one-pot method** enables micro- and nano-encapsulation of various species for biological imaging, sensing, drug delivery systems, materials for bio-separation and purification. Additionally, this technique can be used for magnetic triggering various chemical processes, including polymerisation and catalytic reactions. The key advantages of our method include:

- Fast, and simple method
- Low cost
- Efficient and versatility
- Possibility of remote control and manipulation

Applications

Traditional phase-transfer reactions and catalysis (PCR and PTC) are currently used in various industrial applications and research fields, including the production of:

- Surfactants
- Polymers
- Adhesives
- Sealants
- Petrochemicals
- Agricultural chemicals
- Dyes
- Pharmaceuticals
- Flavours & fragrances

Available for license

- Nanomaterials
- Photovoltaic materials
- Explosives



Phases 1 and 2 immiscible, preventing reaction from taking place

Solved utilising our technology:



The opportunity

This technology is currently in product development/customer testing stage. There are various support mechanisms and grant schemes suitable for the further development of this technology and sample products are available on request.

Technology and patent status

A patent application was filed in 2011 (EP11179226.3).

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