



Phase-Transfer Reactions

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

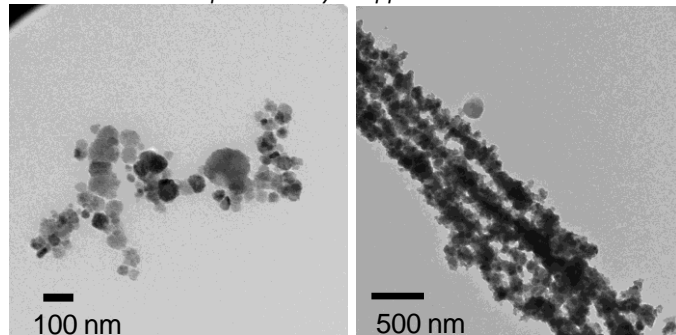
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Basic overview

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 (e.g. polymerisation, condensation, etc.) at aqueous/organic interfaces.

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.

After use of this technology: a reaction has proceeded and 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:

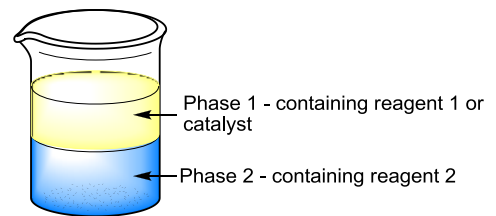
- Fast, and simple method
- Low cost
- Efficient and versatility
- Possibility of remote control and manipulation

Applications

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

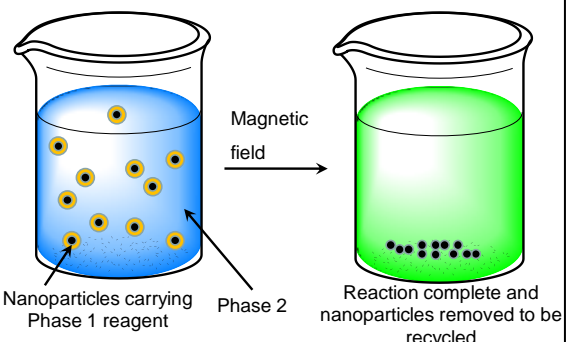
- Surfactants
- Polymers
- Adhesives
- Sealants
- Petrochemicals
- Agricultural chemicals
- Dyes
- Pharmaceuticals
- Flavours & fragrances
- Nanomaterials
- Photovoltaic materials
- Explosives

Traditional challenge of immiscible phases:



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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