

## Department

## Design, Implication, and Synthesis of Magnetic Nanomaterial's (MNPs): Applications in Chemistry

### Team Members

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## Dr. Manoj B. Gawande

M. B. Gawande, completed Ph.D. (Chemistry) from Institute of Chem. Techn., India. Presently, working with Prof. Paula S. Branco, at Dep. Chem FCT-UNL. Our current focus is on benign organic reactions, magnetic nanomaterials and design of nanocatalyst. He has over 35 scientific publications.

## Objectives

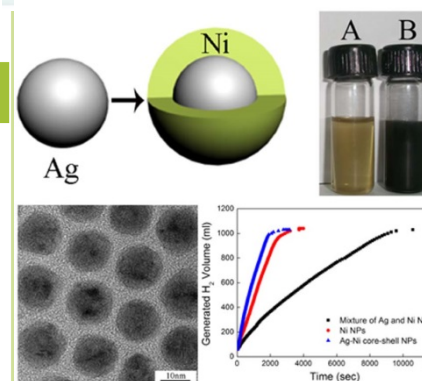
Design of new Nano magnetic catalysts (Ferrite- metals or ferrite-M-oxides) and synthesis by using inexpensive precursors. Anchoring of Ferrite by organocatalyst or ligands and its applications in organic synthesis. Synthesis of Ferrite-M-NHC (N-heterocyclic carbene) magnetic recoverable carbene metal nanocatalyst and its applications. Synthesis and applications of Nanomaterial's will be performed under sustainable conditions. Recovery of the catalyst was not really a serious concern. However, in "green chemistry" approaches for catalytic reactions, the recovery and reuse of catalysts becomes an important factor because of stringent ecological and economical demands for sustainability



## Methodology

In recent years there are several developments and synthetic protocols that easily prepare a wide range of magnetic nanoparticles highly crystalline and uniform in size. However, we shall emphasize on benign synthetic methods, from inexpensive starting materials in water without using any reducing or capping reagent;

- Co-precipitation method
  - Impregnation method
  - Anchoring in water with mechanical stirring
- Characterization shall be done by, SQUID magnetometry, TEM/HR-TEM and SEM, XRD, SIMS, FT-IR and XPS.



## Expected Results

Our main objective is not only to prepare novel, inexpensive, recoverable and recyclable ferrite-functionalized or supported catalyst but to investigate the organic reactions under green sustainable conditions. A further extension of this project is the preparation of Ferrite-M-NHC (magnetically recoverable N-heterocyclic carbenes). To the best of our knowledge, the synthesis of Ferrite-M-NHC and applications is largely untapped. Very recently, we have synthesized nanomaterials and its applications in organic chemistry is more demanded in the point of view green chemistry.

### Selected Publications-

*Chemical Society Reviews* 2013, DOI:10.1039/C3CS60025D  
*Chemical Society Reviews* 2013, DOI:10.1039/C3CS35480F  
*Green Chemistry* 2013, 15, 682 ; *Chem. Eur. J.* 2012, 18, 12628 ;  
*ChemPlusChem* 2012, 77, 865 ; *RSC Advances* 2013, 3, 1050 ; *Bio. Med. Chem.Lett.* 2012, 22, 5727

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