



(II) and Cu (II). These MNPs have been applied as an efficient catalyst to cross- or homo-coupling reaction in important organic transformations.

Recently, we have started the studies on development of functionalized carbon nano tubes (CNTs) as a carrier for RNA- aptamers and plasmid-DNAs.

#### **d) Electrochemical synthesis**

In this new phase of our research program, we have developed novel method for the synthesis of sulfinic acid esters by electrochemical methods. Oxidation of alcohols has been studied by this method.

### **Description of Future Research**

#### **1) *Synthesis of and application of organophosphorus Compounds***

- a) Recently, a cationic lipophosphoramidate has been used as a highly efficient carrier for the plasmid DNA. In this phase of our research program, we will study synthesis, characterization and application of novel cationic phospholipid for delivery of therapeutically active nucleic acids.
- b) The P-C bond formation is very important research interest for the preparation of organophosphorus compounds. The coupling of aromatic, alkene and alkyne compounds with P-H bonds (dialkylphosphite) will be studied using novel recoverable solid catalyst. The solid catalyst including transition metals will be synthesized and also apply for other organic transformations. On the other hand other novel reactions for the synthesis applicable organophosphorus compounds will be studied.

#### **2) *Nanochemistry***

- a) In this new phase of our research program, we will develop novel magnetic nanoparticles (MNPs) of  $\text{Fe}_3\text{O}_4$ , the surface of which is coated with  $\beta$ -cyclodextrins anchored with transition metals. These MNPs have been applied as an efficient catalyst in important organic transformations and also applicable in molecular imaging contrast agents.
- b) Recently, we have started the studies on development of functionalized carbon nano tubes (CNTs) as a carrier for RNA- aptamers and plasmid-DNAs. The carbon nano tubes will be functionalized with amino bisphosphonates followed by complex formation will use as molecular imaging contrast agents in MRI.
- c) Novel functionalized carbon nano tubes with cationic lipophosphoramidate will be synthesized and will apply for delivery of therapeutically active nucleic acids.
- d) Novel phospholipids will be synthesized and will use as capping agents for the synthesis of metal nanoparticles.

#### **3) *Electrosynthesis***

- a) Recently, we have reported the electrochemical synthesis of sulfinic acid esters using simple starting materials. On the other hand electrochemical oxidation of alcohols has also examined using simple electrodes in undivided cells. The electrochemical synthesis of other important biological compounds such as organophosphorus and organosulfur compounds will be studied in simple undivided cells.