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GREENER SYNTHETIC ROUTES TO BIOACTIVE AND INDUSTRIALLY USEFUL COMPOUNDS THROUGH BIOCATALYTIC AND MICROWAVE-ASSISTED REACTIONS

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Green Chemistry is currently one of the most important philosophies in chemistry since it represents a major change in the way we think about practicing chemistry and using chemicals. The challenges for chemists and researchers are to develop new products, processes and catalysts that achieve all the benefits of sustainable development, and discovery of new synthetic pathways for more selective chemistry.

To these ends, we have been working for the past two decades in the areas of biocatalysis and reactions under microwave conditions and in ionic liquids. We have successfully used lipases from different sources, i.e. porcine pancreas, *Candida, Pseudomonas* and *Aspergillus* species in carrying out regio-, chemo- and enantioselective biotransformations on polyols, polyphenolics, sugars, and nucleosides and amino acid derivatives.

We have recently developed a novel chemo-enzymatic synthesis of a few novel polymer systems based on PEG having a broad range of additional chemical functionalities under mild conditions. Simplicity and versatility of this method for the synthesis of highly functionalized amphiphilic polymers with the added advantage of "Green appeal" further enhance its applications as an important strategy. These unique alternating copolymer micelle nanoparticles were used as delivery vehicles targeted to human cancer cells. We have also used lipases for the synthesis of silicone-based monomers, macromers and polymers. The thermal stability of the synthesized organo-silicone polymers was found be superior than those of the materials available today, and these polymers showed excellent flame retardant properties.

We have also used reactions under microwave conditions and in ionic liquids towards the synthesis of novel bioactive heterocyclic compounds and for transformations of nucleosides at ambient temperature and under bulk (solvent-less) conditions. A new ionic liquid (1-methoxyethyl-3-methylimidazolium trifluoroacetate, MoeMIM·TFA has been synthesized), and this has been used for selective benzoylaion of nucleosides in high yields under ambient conditions, which otherwise is a tedious task in the conventional organic solvents. We have also synthesized carbohydrate-based novel bis(ammonium) chiral ionic liquids (CILs) from isomannide (a by-product of corn industry) as the substrate.

All these examples of Green Chemistry initiatives shall be presented in the talk.

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