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Novel organic transformations in aqueous media

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A great attention has been paid in developing green protocols using recyclable catalysts like water-tolerant Lewis acids, solid acids and solid supported reagents. Non-conventional solvents like water, ionic liquids, polyethylene glycol and, supercritical carbon dioxide have become an alternative reaction media so as to replace volatile organic solvents. Of various metal catalysts, metal triflates and indium salts are more attractive due to their non-toxicity, high catalytic activity and their stability to air and moisture. They are highly oxophilic in nature and can activate carbonyl compounds effectively to facilitate the reaction even in water. Indium salts can be used effectively in aqueous media to transform carbohydrates into various biologically active heterocycles. They are compatible with free hydroxyl groups, amines and unprotected sugars. Metal triflates such as $In(OTf)_3$, $Sc(OTf)_3$and $Yb(OTf)_3$ are used to activate aldehydes and imines in facilitating three-component reactions, imino-Diels-Alder reactions, ortho-quinonemethidecyclo additions, aza-, and thia-Michael reactions. In addition to indium salts, cerium salts in particular, $CeCl_3.7H_2O$ are also effective to promote the organic reactions in aqueous medium. Acid catalyzed reactions such as Prins cyclization and Ferrier rearrangement are performed using water-tolerant Lewis acids. Biocatalytic transformations are considered as one of the important strategies of "green chemistry". Biocatalysis have proven to be very useful technology in chemical industry. Asymmetric biocatalytic reduction has attracted a great attention from the green chemistry perspective. Bioreduction of prochiral ketones is known using intact plant cells (whole plant tissues/cells) and isolated enzymes that are obtained directly from cut portions of plant or by plant tissue culture and microorganisms. The chiral reduction of various bioactive compounds containing the keto functionality e.g., acetophenones, cyclic ketones, β-ketoesters, azidoketones and aliphatic ketones using vegetables as a source of enzymes that are responsible for bio-reduction of prochiral ketones with substrate specificity, low biocatalyst to substrate ratio, reaction time and optical selectivity will be presented in detail. Also the use of water-tolerant Lewis acids for various carbon-carbon and carbon-hetero atom bond formation under aqueous conditions will be discussed briefly.

Biography

J S Yadav has completed his PhD from M.S. University, Baroda, India and Postdoctoral studies at Rice University, Houston, USA. He was the Director of the prestigious Indian Institute of Chemical Technology, Hyderabad, India for over a period of 9 years and presently is serving as CSIR Bhatnagar Fellow at the same Institute. He has published more than 1050 papers in reputed journals and has been serving as an editorial board member of repute. He received several prestigious awards and honors for his excellent contributions as a research scientist.

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