‘GREENER’ CHEMICAL SYNTHESES USING MICROWAVES

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The diverse nature of chemical entities requires various green strategic pathways in our quest towards attaining sustainability. A solvent-free approach that involves microwave (MW) exposure of neat reactants (undiluted) catalyzed by the surfaces of less-expensive and recyclable mineral supports such as alumina, silica, clay, or doped surfaces is presented which is applicable to a wide range of cleavage, condensation, cyclization, rearrangement, oxidation and reduction reactions including rapid one-pot assembly of heterocyclic compounds from in situ generated reactive intermediates. The strategy is adaptable to multi-component reactions e.g. Ugi and Biginelli reactions for rapid assembly of a library of compounds. Synthesis of a wide variety of significant precursors and intermediates namely, enones, imines, enamines, nitroalkenes, and oxidized sulfur species is depicted and their value in concise synthesis of flavones, tetrahydroquinolones, 2-aroylbenzofurans, and thiazole derivatives is illustrated.

Recent results on MW-assisted solventless preparation of ionic liquids and the application of microwave heating in aqueous medium for a rapid the preparation of cyclic amines and tertiary amines is described. The synthesis of cyclic amines, important building blocks for pharmaceuticals, is accelerated via double N-alkylation of primary amines thus shortening the reaction time significantly. The protocol utilizes readily available primary amine and alkyl dihalides to assemble two C-N bond in a simple SN2 cyclization experimental protocol and avoids the conventional multi-step approach that involves expensive metal catalysts. A three-component solventless coupling of aldehyde, alkyne and amine (A3 coupling) has also been optimized that uses only CuBr as a catalyst. The potential application of this reaction in the enantioselective construction of a new chiral center by utilizing an effective chiral ligand such as 2,6-bis-[(4S)-(-)-isopropyl-4,5-dihydro-oxazol-2-yl]-pyridine will be described.

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