Strategies for the Green Synthesis of Organics and Nanomaterials

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The presentation summarizes our recent activity in chemical synthesis involving benign alternatives, such as the use of supported reagents, and greener reaction medium in aqueous or solvent-free conditions.[1] The synthesis of heterocyclic compounds, coupling reactions, and a variety of name reactions[2] are the primary beneficiaries as exemplified by the synthesis of *N*-aryl azacycloalkanes, isoindoles, and dihydropyrazoles, 1,3,4-oxadiazoles, 1,3,4-thiadiazoles, 1,3-dioxanes, pyrazoles, catalyzed by basic water or polystyrene sulfonic acid (PSSA) in aqueous media in conjunction with microwave (MW) irradiation.[2]

Vitamins B_1, B_2, C, and tea and wine polyphenols which function both as reducing and capping agents, provide extremely simple, one-pot, green synthetic methods to bulk quantities of nanomaterials in water.[3a] Shape-controlled synthesis of noble nanostructures *via* MW-assisted spontaneous reduction of noble metal salts using sugars will be presented.[3b] A general method has been developed that accomplishes the cross-linking reaction of poly (vinyl alcohol) (PVA) with metallic systems such as Pt, Cu, and In; bimetallic systems, namely Pt-In, Ag-Pt, Pt-Fe, Cu-Pd, Pt-Pd and Pd-Fe;[3c] and SWNT, MWNT, and C-60.[3d] The strategy is extended to the formation of biodegradable carboxymethyl cellulose (CMC) composite films with noble nanometals;[3e] such metal decoration and alignment of carbon nanotubes in CMC is possible using MW approach[3f] which also enables the shape-controlled bulk synthesis of Ag and Fe nanorods in poly (ethylene glycol).[3g] MW hydrothermal process delivers magnetic nanoferrites[4] and micro-pine structured catalysts are also obtainable in water from readily available metal salts.[5] The sustainable generation of nano particles and their applications in catalysis[6,7] and environmental remediation[8] will be highlighted.

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