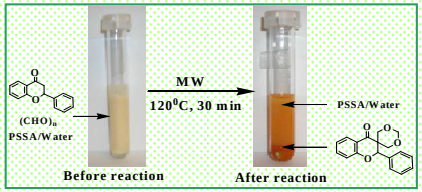
Microwave-Assisted Rapid Access to Bio-active Heterocycles

Vivek Polshettiwar and Rajender S. Varma
U.S. Environmental Protection Agency,
NRMRL, Sustainable Technology Division,
Cincinnati, OH 45268 USA.
Tel: (513) 487-2701; Fax: (513) 569-7677
E-mail: Polshettiwar.Vivek@epa.gov; Varma.Rajender@epa.gov

Introduction:

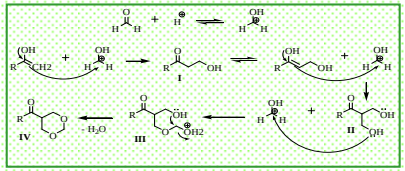
The demands for new bio-active heterocycles in the fields of healthcare, combined with the pressure to produce these substances expeditiously and in an environmentally benign fashion, pose significant challenges to the synthetic chemical community. We have successfully synthesized a wide variety of these heterocyclic compounds by using various greener techniques, such as selective MW-heating of neat reactants under solvent-free conditions, using supported reagents and using benign solvents such as water and PEG.

Tandem Bis-Aldol Reaction of Ketones: A Facile One Pot Synthesis of 1,3-Dioxanes in Aqueous Medium



A novel Tandem Bis-Aldol reaction of ketone with paraformaldehyde catalyzed by polystyrenesulfonic acid (PSSA) in aqueous medium delivers 1,3-dioxanes in high yield.

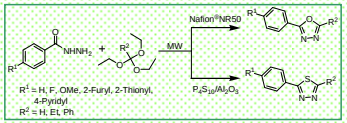
Mechanism- PSSA Catalyzed Tandem Bis-Aldol Reaction of Ketones



The reaction involved the addition of protonated formaldehyde (generated by microwave exposure of paraformaldehyde with PSSA/Water) molecule to ketone (enol) to form β-hydroxy ketone I. This was followed by the addition of another protonated formaldehyde molecule to I to yield diol II, that in turn attacks the third formaldehyde molecule to give adduct III, which after dehydration yields the final product 1,3-dioxane IV.

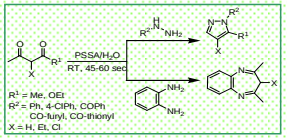
Vivek Polshettiwar & R. S. Varma, *J. Org. Chem.* **2007**, *72*, 7420.

One-Pot Solvent Free Synthesis of 1,3,4-Oxadiazoles & 1,3,4-Thiadiazoles



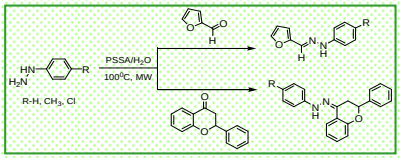
Vivek Polshettiwar & R. S. Varma, *communicated*.

Room Temperature Synthesis of Pyrazoles and Diazepines in Aqueous Medium



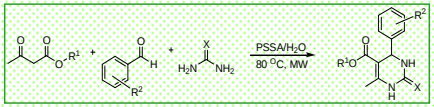
Vivek Polshettiwar & R. S. Varma, *communicated*.

Hydrazone Synthesis in Aqueous Medium



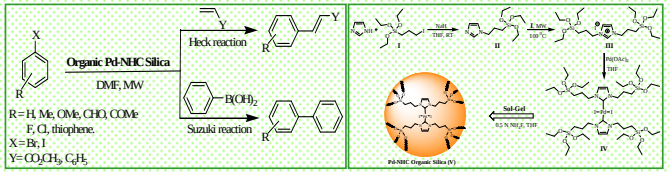
Vivek Polshettiwar & R. S. Varma, *Tetrahedron Lett.* **2007**, *48*, 5649.

Biginelli Reaction in Aqueous Medium



Vivek Polshettiwar & R. S. Varma, *Tetrahedron Lett.* **2007**, *48*, 7343.

Pd-N-Heterocyclic Carbene (NHC) Organic Silica: Synthesis and Application in C-C Coupling Reactions



We have developed a new concept for the design and synthesis of highly active and recyclable heterogenised Pd-NHC catalysts in the form of organic silica, which does not use any inorganic sol-gel precursor and most of its sites are catalytically active. This work could shed new light on transition-metal catalysis.

Vivek Polshettiwar & R. S. Varma, communicated.

Recent Review's from Our Group:

1. Greener and sustainable approaches for the synthesis of pharmaceutically active heterocycles.
Polshettiwar & Varma, *Curr. Opi. Drug Disc. Dev.* **2007**, *in press (Nov. 07 issue)*.
2. Greener and Expeditious Synthesis of Bio-active Heterocycles using Microwave Irradiation.
Polshettiwar & Varma, *Pure App. Chem.* **2007**, *in press*.
3. Microwaves in Green and Sustainable Chemistry,
R. S. Varma, *Top. Curr. Chem.* **2006**, *266*, 199.