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Current Trends in Aqueous Mediated Organic Synthesis

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The rapid evolution in organic synthesis in recent years has seen dramatic changes in chemical sciences. One need only mention a few terms to understand that chemical systems that did not exist twenty years ago have become as much a part of the repertoire of the synthetic organic chemist such as the use of advanced microwave technology, photocatalytic synthesis, flow chemistry, used of advanced nanomaterials in organic synthesis and new innovative greener technology (catalysts-free processes) to design corresponding entity in a benign way [1-5].

Last few years, there are various green solvents introduced in several organic methodologies such as polyethylene glycol (PEG), glycerol, ionic liquid, supercritical carbon dioxide ($scCO_2$) and water etc. [6,7]. It is well-known that water is the most benign solvent used for the organic synthesis and is a prime choice for organic chemists [8,9]. The chemistry of water is relatively old tremendous organic methodology that was investigated in last 20 years. The aim of this editorial is to provide a brief overview of the most promising, alternative reaction methodologies that can be employed in organic synthesis with the drive of safer, more sustainable as well as low environmental impact processes, which are crucial to application of improved efficiencies for organic synthesis in industry. This editorial highlights the some selective catalyst-free reactions in aqueous media (in-water and on-water); details of in-water and on-water organic reactions are well reviewed in the literature very recently (Figure 1) [10,11].

Prior to the innovative work in the early 1980s, the usage of water for the Diels–Alder reaction was inadequate, although the very first recognized example was described by Diels and Alder in 1931 for the reaction of maleic anhydride and furan; [12] this cycloaddition was accomplished by the addition of furan in maleic anhydride solution in water. With vital shaking, the oily diene ultimately gets dissolved and a crystalline adduct (diacid) was observed, (Scheme 1); this is the predictable product after hydrolysis, if the reaction had happened via maleic anhydride.

The applicability of water as a solvent in organic synthesis was re-examined by Breslow in 1980; [13,14] who exposed that hydrophobic effects might strongly enrich the rate of various organic synthetic

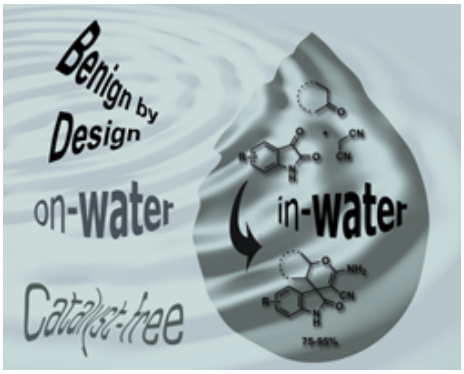
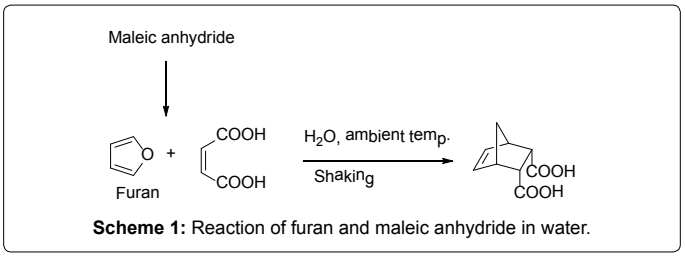


Figure 1: On-water and in-water catalysts-free organic synthesis.



Scheme 1: Reaction of furan and maleic anhydride in water.

transformations. Earlier, the limited solubility of the reactants in water was the main reason that limited the use of water in organic reactions.

Keeping in mind the aim and objectives of this arena, I have focused on some key reference on catalyst-free on-water and in-water organic reactions. Especially, On-water reactions refer to the noteworthy occurrence of substantial rate accelerations, when insoluble reactants are stirred in aqueous suspensions. The water surface itself has been proposed as a catalyst itself in such reactions, but the exact prospective of "on effects" is currently unknown. In recent literature, there are few reports on nanocatalysed on-water organic reactions, which help to find way for other important nanocatalysed organic transformation. In the light of these principles, further developments of benign practices are expected in the coming decade and I believe that these editorial and cited key references will motivate scientists and researchers across the globe to develop yet more innovative, inexpensive, and benign approaches that can address all sustainable chemistry principles.

References

1. Gawande MB, Bonifácio VDB, Luque R, Branco PS, Varma RS (2014) Solvent-Free and Catalysts-Free Chemistry: A Benign Pathway to Sustainability Chem Sus Chem 7: 24-44.
2. Varma RS (2014) Journey on greener pathways: from the use of alternate energy inputs and benign reaction media to sustainable applications of nano-catalysts in synthesis and environmental remediation. Green Chem 16: 2027-2041.
3. Gawande MB, Branco PS, Varma RS (2013) Nano-magnetite (Fe_3O_4) as a support for recyclable catalysts in the development of sustainable methodologies. Chemical Society Reviews 42: 3371-3393.
4. Pastre JC, Browne DL, Ley SV (2013) Flow chemistry syntheses of natural products. Chemical Society Reviews 42: 8849-8869.
5. Pieber B, Martinez ST, Cantillo D, Kappe CO (2013) In Situ Generation of Diimide from Hydrazine and Oxygen: Continuous-Flow Transfer Hydrogenation of Olefins. Angewandte Chemie International 52: 10241-10244.

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6. Sheldon RA (2005) Green solvents for sustainable organic synthesis: state of the art. Green Chemistry 7: 267-278.

7. Gawande MB, Rathi AK, Branco PS, Nogueira ID, Velhinho A, et al. (2012) Regio- and Chemoselective Reduction of Nitroarenes and Carbonyl Compounds over Recyclable Magnetic Ferrite-Nickel Nanoparticles (Fe_3O_4-Ni) by Using Glycerol as a Hydrogen Source. Chemistry-a European Journal 18: 12628-12632.

8. Li C-J, Chen L (2006) Organic chemistry in water. Chemical Society Reviews 35: 68-82.

9. Gawande MB, Branco PS (2011) An efficient and expeditious Fmoc protection of amines and amino acids in aqueous media. Green Chemistry 13: 3355-3359.

10. Gawande MB, Bonifacio VDB, Luque R, Branco PS, Varma RS (2013) Benign by design: catalyst-free in-water, on-water green chemical methodologies in organic synthesis. Chem Soc Rev 42: 5522-5551.

11. Chanda A, Fokin VV (2009) Organic Synthesis "On Water". Chem Rev 2009 109: 725-748.

12. Diels O, Alder K (1931) Ann Chem 490: 243–247.

13. Rideout DC, Breslow R (1980) Hydrophobic acceleration of Diels-Alder reactions. Journal of the American Chemical Society 102: 7816-7817.

14. Breslow R (1991) Hydrophobic effects on simple organic reactions in water. Accounts of Chemical Research 24: 159-164.