

## Review of Aqueous Microwave Assisted Chemistry: Synthesis and Catalysis

**Aqueous Microwave Assisted Chemistry: Synthesis and Catalysis.** Edited by Vivek Polshettiwar (EPA, Cincinnati, USA) and KAUST Catalysis Centre, Thuwal, KSA) and Rajender S. Varma (EPA, Cincinnati, USA). Royal Society of Chemistry: Cambridge. 2010. xiv +228 pp. \$169. ISBN 978-1-84973-038-9.

Microwaves and water go together very well. Indeed, when food is placed into a microwave oven at home, the water interacts strongly with the microwave irradiation, leading to rapid heating. It therefore comes as little surprise that synthetic chemists have paired water as a solvent and microwave irradiation as a convenient method of heating. This is the theme running throughout the book *Aqueous Microwave Assisted Chemistry: Synthesis and Catalysis*, edited by Polshettiwar and Varma, who have also authored three of the seven chapters. Both are well-known for their work in the area of microwave-assisted synthesis, and Varma is considered a prominent elder statesmen of the field. The other chapters are written by less well-known authors, bringing a new perspective to the field. With the exception of the introduction, each chapter has a series of representative experimental procedures at its end. The level of detail varies from chapter to chapter. In some cases, the procedures are cut from the literature but do not include details, such as what sort of microwave unit was used, and key reaction parameters are sometimes omitted. As a result, the reader must go to the original research article to gain all the necessary information in order to reproduce the reactions safely, which somewhat detracts from the point of including the procedures in the book.

The first chapter, authored by the editors, is an introduction to microwave heating and use of water as a solvent. Topics such as green chemistry, catalysis in aqueous media, and the interaction of microwave energy with molecules are briefly discussed. The authors also get into the murky area of microwave effects and make some statements that, given the number of recent literature reports on the subject, may be confusing to say the least. They seem to be proponents of the idea that microwave heating has special properties rather than simply being a method of heating. In the next three chapters, the use of water as a solvent in conjunction with microwave heating for metal-catalyzed reactions, coupling reactions, and the preparation of bioactive heterocycles is discussed, respectively. In each, the literature of the respective areas is reviewed, with examples up to the end of 2009 being given.

Chapter Five is focused on enzymatic reactions. This is another area where there has been significant debate as to the origins of the rate accelerations observed when performing reactions using microwave as opposed to conventional heating. In addition to a discussion of the topic, a table outlining the various reports and whether they do or do not imply nonthermal microwave effects is provided. Topics, such as the use of cosolvents, be they organic or ionic liquids, and the development of microwave-assisted

proteomics are also briefly described. This chapter is followed by one on polymer synthesis. Again the recent literature is reviewed and the authors focus not only on the preparation of polymers from monomeric starting materials but also on the modification of polymeric materials. Particular emphasis is placed on the applications of the now ubiquitous “click chemistry” as well as on transition-metal mediated couplings.

The final chapter moves away from the theme of organic chemistry seen in the earlier chapters. It has a focus on the synthesis of nanomaterials derived from different metal salts and their use as catalysts for a number of transformations. Although I admit to being a nonexpert in this field, I was left with the feeling that the synthesis of nanomaterials using microwave heating is a bit of a black art in some regards. Different morphologies are described depending on the microwave power used, but not with much rhyme or reason behind it. I would like to have seen some unifying themes emerging as the authors reviewed the literature.

Overall, this book brings together a number of different applications of microwave heating when used with water as a reaction medium. However, many of these topics have been reviewed recently in the primary literature. These reviews are often more detailed and more extensive than the corresponding chapters in this book. For someone interested in getting into the field and who does not have access to many chemistry journals, this book may well prove to have value for the money, it being cheaper than purchasing a number of review articles. For many chemists, however, it is really just an overview of material that the reader could have accessed elsewhere, albeit not all in one place.

Nicholas E. Leadbeater\*

University of Connecticut

10.1021/ja111493p