Pergamon

SCIENCE DIRECT®

Tetrahedron: *Asymmetry* 14 (2003) 2847

TETRAHEDRON: *ASYMMETRY*

Preface

Stereoselective radical reactions

A feeling among practitioners of synthetic organic chemistry is that the phrase "*stereoselective radical reactions*" is an oxymoron. The goal for this special issue is to highlight the level of sophistication available to the synthetic chemist in controlling stereochemistry using radical intermediates. It is appropriate that Tetrahedron: *Asymmetry*, a journal devoted to stereochemistry, is the venue for this. Radical reactions can be equivalent to ionic and pericyclic reactions, however, their use at the strategic level of planning has not yet become commonplace. Radicals are extremely useful as reactive intermediates that can be utilized for selective organic transformations. However, scientists are still reluctant to embrace radical chemistry in day-to-day work.

Since the 1980's diastereoselective radical reactions have been investigated extensively, in particular substrate-controlled reactions. This was soon followed by examples of acyclic stereocontrol using chiral auxiliaries. During the last two decades it has been demonstrated that stereoselective radical reactions complement ionic processes and at times surpass them in terms of the diastereoselectivities attained. Another major attribute of radical chemistry is the formation of stereogenic quaternary centers with high levels of selectivity, a rather difficult process under ionic conditions.

In the last decade the first practical examples of enantioselective radical reactions have emerged. Spanning this time, the notion that radical reactions could not be performed with reasonable levels of enantiocontrol was proven incorrect, and several examples of sequential bond construction with diastereo- and enantiocontrol were demonstrated. There are still many challenges to be met for enantioselective radical reactions at the industrial level: catalytic loading, toxicity associated with tin reagents, and the need for a large excess of reagents. Hopefully there will be solutions to these problems in the near future.

A wide-range of stereoselective radical reactions is covered in this issue. Several articles demonstrate the use of chiral auxiliaries to control stereochemistry in bond construction. Incorporation of key stereoselective radical reactions in the total synthesis of natural products is also highlighted. Radical cation/anions are important reactive intermediates in synthetic chemistry. An example on the use of radical cations in cyclization is presented. Radical reactions in environmentally benign solvents have begun to emerge. An example is illustrated by a novel strategy for the synthesis of enantioenriched α-amino acids. Radical reactions are well suited for sequencing multiple bond formations. The use of this protocol in addition–cyclizations and addition–fragmentations to provide access to novel carbo- and heterocycles is exemplified in two contributions which attest to radical chemistry in the construction of complex molecules. Lewis acids have played an important role in the development of enantioselective radical reactions. They facilitate recalcitrant radical reactions and also serve as a vehicle to introduce asymmetry into others. Several articles in the special issue unequivocally demonstrate that high levels of enantioselectivity can be achieved in radical reactions using catalytic amounts of chiral Lewis acids.

I am very grateful to all the friends and colleagues who have contributed to this special issue and made it possible to cover many important synthetic aspects of radical chemistry. I thank them for their contributions. Finally, I would also like to thank Professor Kevin Burgess, American Regional Editor, Tetrahedron: *Asymmetry*, for being the catalyst for this. I am optimistic that this collection will stimulate future developments in the field. and hope that practitioners of synthetic organic chemistry will find it worthy of perusal.

Mukund Sibi (Special Issue Guest Editor)
North Dakota State University, Fargo, ND, USA

0957-4166/$ - see front matter
doi:10.1016/j.tetasy.2003.08.008