

Book Review

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Metallocenes in Regio- and Stereoselective Synthesis (Series: Topics in Organometallic Chemistry, Vol. 8)

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Metallocenes are now looking back on a long history that caused much excitement among the chemical community. The focus of the research has changed somewhat, however, from fundamental theoretical considerations of this class of compounds to possibilities of their employment in applied activities such as synthesis.

Volume 8 of the Topics in Organometallic Chemistry series sheds light on the state of the art and on recent advances with respect to using metallocenes in organic synthesis. While the six chapters have some common denominators, there are also perceptible differences among them. Chapter 1 is devoted to hydrozirconation and its applications. What makes this review unique is that the authors have included a number of experimental protocols, encouraging their readers not only to study hydrozirconations theoretically but also to put their (newly) acquired knowledge to use. Therefore this review is as close to 'lab life' as any review can possibly get. While it is a rather uncommon practice, I found this 'short-circuiting' between 'ordinary' reviews and the primary literature quite stimulating—even in the absence of a laboratory. While the discussions are not limited to group IV metals, it is clearly evident that these elements—Ti and Zr in particular—are receiving heightened attention in research laboratories. The second chapter is devoted to construction of carbocycles via zirconacycles and titanacycles.

Five of the six chapters of the book qualify as state of the art reviews of their

particular topics, summarizing recent advances in a focused way. The length of each of these chapters is in the 20–30+ pages range. The one contribution that stands out is Chapter 3 on metallocene-catalyzed selective reactions; spanning more than 80 pages, its sheer size sets it apart from the others. It is not so much a state of the art report, but conveys the impression of the defining, all-encompassing review that sums up its field in its entirety. The impression is underscored the presence of 47 tables summarizing scores of individual reactions. While the comprehensive discussion within this chapter is not limited to them, titanium-catalyzed reactions again make a prominent reappearance that is rivalled by ruthenium, the metal most prominently featured in this review. Anyone who has ever written a major review will appreciate that compiling such an immense amount of data and putting it into a coherent presentation requires a major effort and represents a major achievement. Learning that this was a 'monograph' makes it even more awe-inspiring. Unfortunately this dominating chapter suffers from very poor English which makes reading it quite a chore.

Chapter 4 on diastereoselective, enantioselective and regioselective carbocation reactions catalyzed by zirconocene derivatives once more confirms the frenetic activity in group 4-cene research. Like Chapters 2 and 2, this review is more narrowly focused than chapters 3 and 5.

Chapter 5 deals with stereospecific olefin polymerization catalyzed by metallocene complexes. The reactions discussed in this chapter are probably (and arguably) closest to 'real-life', i.e. industrial, applications. Catalyzing olefin polymerization by metal complexes has a long history connected to such illustrious names as Ziegler and Natta. Recent development of new and novel strategies to exert control over the specificity of this technically important type of reaction can be learned from this review.

Still closer to laboratory scale investigations of the potential of metallocenes in synthesis are reactions discussed in the concluding, sixth chapter. While the vast majority of applications of metals in organic chemistry seem to aim at employing organometallic compounds in synthetic environments, the authors of the final chapter of this book reverse the usual line of sight. Takahashi and Kanno provide a very stimulating account of the possibilities of specific C–C bond *cleavage*, rather than bond formation, via metallocene catalysis. The review does not feature any particular metal, but explores a wide spectrum of transition metals with respect to their powers as mediators of C–C bond cleavages. What I found particularly striking about this chapter was the unusual sense of excitement for their topic that shines through from the beginning to the end. In addition to proving their expert status in their respective field of research, Drs Takahashi and Kanno exhibit an above-average talent for relating new knowledge, a feature normally associated with good textbooks. I found this refreshing presentation rather captivating.

All contributions in this volume are written with great authority, and researchers in organometallic chemistry will find condensed in these reviews lots of information that may turn out to be helpful or interesting, or both. The six chapters in this book are snapshots (at least five, plus a full double feature show) of a field in motion, and it does not seem far-fetched to predict that metallocene research is bound to come up with more surprises and new applications in the future.

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