

The Diels–Alder Reaction Selected Practical Methods.

By F. Fringuelli, A. Taticchi. J. Wiley & Sons Ltd.: Chichester, 2001, hardback £ 130.00; ISBN 0-47180-343-X, 340 pp.

Over seventy years after its discovery, in terms of atom-economy, simplicity and stereoselectivity, the Diels–Alder reaction remains arguably the most powerful tool at the disposal of the contemporary synthetic organic chemist. It has found widespread application, especially in the synthesis of natural products. As every undergraduate student knows, the experimental conditions required to obtain high yields and selectivities are substrate dependant to an unusually high degree, with the effects of temperature, pressure, Lewis-acid catalysis and reaction medium (to a lesser extent) being critical. Even with the advent of modern electronic databases, for the student or researcher wishing to design a synthetic route incorporating this versatile reaction, the prospect of trawling through the labyrinth of literature concerning the Diels–Alder reaction is sometimes a daunting prospect!

It is with this in mind that Fringuelli and Taticchi have decided to write a follow-up to their earlier work *Dienes in the Diels–Alder Reaction* (1990). In this offering, *The Diels–Alder Reaction Selected Practical Methods*, the authors set out to give the reader not only an idea of the scope and potential of the Diels–Alder reaction, but also the various conditions required for each type of transformation. In this regard the title is somewhat misleading as no experimental procedures are given. However the approach taken in putting this book together is both novel and helpful.

The first chapter consists of a general outline of the reaction in its many forms (pericyclic-, ionic-, radical-, homo-, hetero-, retro-, normal/inverse electron demand- and domino-Diels–Alder reactions) and the different terms associated with these methodologies are defined. This chapter also includes a theoretical section, with Frontier Molecular Orbital theory briefly referred to. Although the book is aimed at both under- and postgraduate level students, the tyro who is hoping to use this book as a study aid will find this section disappointingly short. Chapter two deals with the thermal uncatalysed variety of

the Diels–Alder reaction. It is here that one begins to get a feel for the effects of substrate structure on reactivity, as divined from the various conditions required for each reaction. All of the major diene- and dieneophile types are discussed and the examples are varied and well chosen. At the end of this section (and also at the end of chapters four, five and six) is quite a nice feature consisting of a collection of referenced graphical abstracts to demonstrate the capabilities of each particular methodology. Chapter three details by example the potent effect of Lewis-acid catalysis in terms of both efficiency and stereoselectivity. This section is well written and gives an overview of the merits of each type of catalyst, leading onto modern concepts of outstanding significance such as solid supported Lewis-acids and chiral catalysts.

Chapter four is a summary of the miscellaneous chemical and physical methods that have been employed to promote the Diels–Alder reaction, such as solid-phase reagents, ultrasound- micellular-, microwave-, and biocatalysis. This is an excellent and timely section, which will introduce many to some of the lesser known yet perfectly viable concepts and methodologies available. Heading back to more familiar ground, chapter five deals with the well-documented effects of pressure, with particular reference to diene structure. Chapter six is perhaps the most forward-looking, and deals with the topical theme of the advantages, both chemical and environmental, of performing Diels–Alder reactions in unconventional media such as water, ionic liquids and supercritical fluids amongst others. The last chapter is a list of reviews, monographs and symposia concerning the Diels–Alder reaction written in the period 1990–2001. This is a nice touch, which greatly enhances the book's utility as a reference manual.

Despite several editorial errors, which are sometimes distracting (89 on page 218 being typical) this is a well thought out and informative work, which will be a useful asset to all researchers involved in organic synthesis.

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