

**The Nitro Group in Organic Synthesis.** Edited by N. Ono. John Wiley-VCH: New York, 2001, 392 pp, £ 92.95, hardback. ISBN 0-471-31611-3.

This monograph, intended as the first in a Wiley series on organic nitro chemistry, gives a comprehensive overview of the nitro group in organic synthesis. The coverage is thorough and the material well presented; the text is concise but is amply illustrated with equations, schemes and tabulated data. Recurring features of the discussions include environmental and economic issues, experimental tips, mechanistic details, functional group tolerance, regio- and stereoselectivity issues. Asymmetric variants of individual reactions are included. Where appropriate reference is made to the synthesis of naturally occurring compounds. Individual chapters are extensively referenced with specific mention given to up-to-date reviews (citations up to the year 2000) and the book is well indexed. This text provides a valuable insight into the diversity of organic nitro chemistry and will be attractive to synthetic chemists at large.

After a short introduction chapter 2 describes the preparation of nitro compounds by nitration of hydrocarbons and by oxidation of amines and oximes. A useful feature of the chapter is the inclusion of several catalytic methods.

Chapters 3,4 and 5 discuss reactions dependant on the electrophilic properties of the nitro group. Chapter 3 details the preparation (Henry reaction) and synthetic potential of  $\beta$ -nitro alcohols. The discussion is rich in experimental detail and there is considerable emphasis on progress towards stereocontrol with the presentation of Newman projection diagrams to rationalise diastereoselectivity.

Michael addition and the synthetic worth of the resulting adducts is discussed in chapter 4, two key sections are identified, nitroalkenes as Michael acceptors and nitroalkanes as Michael donors. Valuable reference is made to tandem processes, including at least one Michael addition, for the construction of complex molecular structures. Once again, efforts toward diastereocontrol feature strongly and much attention is afforded to the application of Michael reactions to natural product synthesis.

Competing C- and O-functionalisation of nitroalkanes is problematic and chapter 5 outlines methods for regioselective C-alkylation, acylation, arylation and heteroatom incorporation. In particular there is a useful treatment of radical substitution and transition metal catalysed approaches to C-alkylated derivatives.

Whilst the nitro group may be pivotal in skeletal construction it may not feature in the target compound and a broad survey of methods for its removal or conversion to another functionality is the subject of chapters 6 and 7. Oxidative, reductive and acid mediated routes to the carbonyl group as well dehydration to nitrile oxides and conversion to nitriles is reported. Reduction to amines, hydroxylamines, oximes and imines is discussed and a useful list of reagents and conditions to control the extent of reaction is included. Nucleophilic replacement of the nitro group mediated by radical and ionic processes are reported. In a lengthy discussion of radical denitration (denitrohydrogenation) tin hydrides are nominated as the reagent of choice.

The importance of nitro compounds in cycloaddition chemistry justifies the comprehensive treatment of this topic in chapter 8. The opening sections discuss nitroalkenes as  $2\pi$  components and nitro compounds as precursors to 1,3-dipoles (cyclic nitrones, nitrile oxides and nitronates) and their cycloadditive properties. Due attention is paid to *exo*-/*endo*-selectivity, the effect of additives, catalysts and asymmetric variants. Finally Denmark's elegant [4+2][3+2] cycloadditions of nitroalkenes with its inter-/intramolecular combinations is discussed at length. Numerous examples of post cycloaddition modification and, in this chapter above all others, application to natural product targets is richly illustrated.

The penultimate chapter deals with nucleophilic aromatic substitutions, examples are given where the nitro group provides the activation or behaves as the leaving group. The NASH reaction (nucleophilic aromatic substitution of hydrogen), of contemporary synthetic importance, is dealt with in detail covering carbon-centered and heteroatom nucleophiles as well as its application for the synthesis of heterocycles.

The final chapter, dedicated to the synthesis of heterocycles from nitro compounds, concentrates on the biologically important pyrrole and indole units. Saturated heterocycles are given a less thorough coverage.

In conclusion, this monograph provides the organic chemistry community with a comprehensive, yet clearly presented account of nitro group chemistry. Its focus on recent advances in the area and the provision of experimental and mechanistic details means the book will have appeal to established researchers and novices alike.

**F. Heaney**, National University of Ireland, Maynooth, Co. Kildare, Ireland