

Book review

Houben-Weyl Methoden der organischen Chemie, 4th Edition, E. Müller, editor-in-chief, Volume V/2a, "Alkine, Di- und Polyine, Allene und Kumulene", V. Jäger, M. Murray, U. Niedballa and H. G. Viehe, volume authors, Georg Thieme-Verlag, Stuttgart, 1977, xlvii + 1247 pages, DM 880.

This latest volume of the useful Houben-Weyl series on organic chemistry brings all that one would want to know about the preparation and reactions of three interesting and important classes of unsaturated hydrocarbons: acetylenes, di- and polyacetylenes and allenes and higher cumulenes.

The excellent chapter on acetylenes by Jäger and Viehe takes up about two-thirds of the volume. A useful general section begins the chapter. This covers nomenclature, physical and spectroscopic properties, structural and electronic properties of the $C\equiv C$ bond, solubilities of acetylenes, purification and hazards of acetylene and its derivatives and, briefly, reaction types of the $C\equiv C$ bond and technical utilization of acetylene itself. Sections devoted to the preparation of acetylenes by diverse routes, some useful, some strictly academic, and to the interconversions of acetylenes follow. A 50-page section covers organometallic acetylene derivatives, principally alkynyl-lithium, sodium and Grignard reagents, but also boron, aluminum, silicon, copper, zinc and mercury derivatives of acetylenes, and with references to acetylenic compounds of other metals. Organometallic protecting groups for acetylenic C-H bonds (e.g., trimethylsilyl derivatives) and for the $C\equiv C$ bond itself (the $Co_2(CO)_6$ group) are discussed. Reactions of acetylenes are covered in some detail: oxidation; addition reactions, including the addition of boron, aluminum and Group IV hydrides, of trialkylboranes and boron and Group V halides, to mention those reactions which give organometallic products; cycloadditions and cyclo-oligomerizations (catalyzed by transition metal complexes such as dicobalt

octacarbonyl). The formation of stable transition metal-acetylene complexes by reactions of acetylenes with suitable transition metal species, however, will be dealt with in another Houben-Weyl volume which is in preparation.

The chapter on di- and poly-ynes by U. Nieballa is a short one (46 pages) which covers the preparation, reaction chemistry and spectroscopy and analysis of this class of compounds. Here also organometallic chemistry plays an important role in the coupling of terminal acetylenes to give such polyacetylenic products. Allenes and higher cumulenes are the subject of the third chapter by M. Murray. The content and organization of this chapter parallels more or less that of the acetylene chapter. Organometallic preparative routes are of some importance in allene and cumulene synthesis, but in the section on the reactions of Allenes we learn that their transition metal π -complexes will be treated in another Houben-Weyl volume.

This new addition to the Houben-Weyl series will be of use to all organometallic (and, of course, organic) chemists whose research involves acetylenes and cumulenes in one way or another. While many acetylenes can be purchased, far more still have to be prepared, and this book will be an invaluable guide to their preparation, as well as to their chemistry. It provides useful discussions and copious references to the primary and review literature, and it is up-to-date (even some 1977 references are encountered), for which all concerned—authors, editor and publisher—are to be commended. The only drawback is that this book is in German, which will be troublesome to many of its potential users whose German is nonexistent or not quite adequate. However, the liberal use of formulas and equations and of tables should help the non-German reader. While some tables may be found in this book, it should be emphasized that the aim of the Houben-Weyl series is a thoroughly referenced discussion of synthesis and chemistry of organic compound classes. The exhaustive listing of individual compounds is left to the Beilstein handbook.

This excellent book should be in all libraries used by organic and organometallic chemists. Its price, unfortunately, pretty much precludes individual ownership.

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