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Book review

Annual Reports on NMR Spectroscopy, Volume 19, edited by G.A. Webb, Academic Press, London, 1987, xi + 325 pages, £55, ISBN 0-12-505319-3.

The latest volume of this long running series of review articles on all aspects of NMR spectroscopy is one of particular interest to readers of this journal, as the two longest of the four articles have a substantial organometallic content.

To deal with the two shorter chapters first, one is a thorough review of ^{33}S NMR by J.F. Hinton. This covers the experimental problems encountered in observing this low abundance, low magnetogyric ratio nucleus, the factors that determine chemical shifts and linewidths, and a tabulation of data from the 150 or so compounds whose ^{33}S spectra have been measured. The low sensitivity and broad lines, particularly for 2-coordinate sulphur, make this an unappealing nucleus, and there have been few applications to actual chemical problems. This article, useful though it is for reference purposes, is unlikely to send chemists rushing to their spectrometers.

The second article, by Bastiaan, Maclean, Van Zijl and Bothner-By, describes the emerging topic of very high field, very high resolution NMR. Under these conditions, new splittings can be observed in the NMR spectrum owing to a partial alignment of the molecules by the field, which means that dipolar and quadrupolar interactions are no longer averaged to zero. The article demonstrates how these splittings can be related to structural features and can be used as probes for chemical properties such as aromaticity.

Krishnamurthy and Woods contribute a comprehensive review of the NMR spectra of an important family of heterocycles, the cyclophosphazenes. This covers all relevant nuclei, including ^{15}N , and correlates all chemical shifts and coupling constants to molecular structure both for the heterocycles themselves and for their complexes with metals.

Finally, Orrell and Sik have reviewed recent developments in dynamic NMR in inorganic and organometallic chemistry. This article should be required reading for all readers of this journal, especially those starting out in research in this area, as it shows just what the capabilities of modern NMR spectroscopy are. It begins with a discussion of all the relevant NMR techniques, including band shape analysis, relaxation measurements and the magnetization transfer family of experiments, particularly the two-dimensional EXSY sequence. The second section uses over 200 references to show how these methods are applied in practice to obtain immensely detailed and quantitative information on the mechanisms of a wide range of fluxional processes, including bond rotations, ring conformational changes and pyramidal inversions. This wealth of detail makes parts of the article heavy going, and many of the molecular diagrams are necessarily complex, but the elegance of the processes revealed makes the effort worthwhile.