less, it may be stated that at present almost all investigators agree that Al_2O_3 only serves to enlarge the surface area and maintain the thermal stability. It is not clearly brought out that KOH is a promoter which is needed only in high-pressure experiments. The reason why this should be so has not yet been clarified. It is not impossible that at high pressure virtually the whole iron surface is occupied by chemically adsorbed nitrogen, so that the dissociative adsorption of hydrogen is hampered. It might be that at high temperature the KOH is slightly reduced (see Gmelin, Vol. 22, p. 201). From the work done by Gomer (field ion microscopy) it has appeared that a surface layer of potassium on tungsten is capable of dissociative hydrogen splitting, but does not cause dissociative nitrogen adsorption. This would imply that KOH creates new centers enabling the dissociative splitting of hydrogen (dissociation energy approx. 100 kcal/mole!) to take place also if the entire iron surface is occupied by nitrogen.

A following point for criticism is that the book does not sufficiently stress the great influence which the degree of reduction of the catalyst has on the eventual catalyst activity. It is especially by prolonged reduction of the catalyst with extremely pure hydrogen that a considerable rise of the activity can be brought about. The fact that type and concentration of the promoters greatly influence the rate of the reduction process renders a comparison of the activities of different samples extremely difficult.

All in all, it must be said that this is an excellent book; it is to be hoped that many young investigators may be induced to take up again research in the field of ammonia synthesis, using the newer techniques now available, which are aimed more directly at the study of the catalyst *surface*. In this way the often unfruitful method of trying to find correlations between bulk properties and catalytic properties might be abandoned.

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Experimental Magnetochemistry—Nonmetallic Magnetic Materials. By Michael M. Schieber. North-Holland Publishing Co., Amsterdam, and John Wiley and Sons, New York, 1967. 572 pp., 253 fig. price $28.00.

Those elements and compounds useful in heterogeneous catalysis exhibit, not infrequently, magnetic properties of such a nature and variety as to arouse speculation concerning a possible basic relationship between catalysis and magnetism—a relationship of the kind often discussed between catalysis and semiconductivity. But, except for the magnetic ortho–parahydrogen conversion, no such relationship has been verified for any reaction. The applications of magnetism to catalysis (and they are not unimportant) have thus far been concerned with analytical and structural parameters, like the presence and particle size of a ferromagnetic such as nickel metal, or to the changes in magnetization caused by a chemisorbed molecule, or to the particle size of a typical antiferromagnetic such as chromium sesquioxide. These applications are sufficient for any book on the subject to gain review in the *Journal of Catalysis*, but the reader will not find the word "catalysis" mentioned in the index of this book. The book is reviewed here because it gives a wealth of information about many compounds of actual or potential interest in catalysis. Here are our old standbys—CoO, Cr_2O_3, CuO, Fe_2O_3, MnO_2, MoO_2, VO_2, $ZnCr_2O_4$, and ZnO—together with nearly a thousand others. Who would today dare deny that the magnetoelectric polarization of Cr_2O_3, or the spin–flop transition in V_2O_3, may someday give a clue to those fugitive activated surface complexes that lie at the heart of our problem?

To this reviewer's knowledge there have been five previous books in which the word "magnetochemistry" could be found in the title. The most difficult of these could be read with ease, if not profit, by anyone with an undergraduate major in chemistry. Not so with this book—it requires a preknowledge of elementary solid state physics (and precious little else). Topics covered include an outline of magnetic principles; the preparation of solids, most of which are metal oxides; experimental methods for magnetic measurements; nearly 300 pages dealing with the magnetic properties of specific substances ranging in complexity from CdO to $Gd_2CaMn_2Ge_3O_{12}$; and finally some review problems for the serious reader. In brief, the book is not a book about magnetochemistry, it is a thorough and effective introduction to the magnetic properties of nonmetallic solids, and this is exactly what is implied by the subtitle. The book can be recommended to anyone with an interest in knowing all he can about the inorganic solids with which heterogeneous catalysis is concerned.

No professional chemist can read this book without reflecting on the state and future of chemistry as a science. Inorganic chemistry has seen a phenomenal rebirth and growth in the past

quarter century. A very large fraction of this growth has been in the area of inorganic solids, of which metal oxides are the most important. This growth in metal oxides has been soundly based on theory, supported by immediate technological application, and has resulted in the proliferation of new compounds many of which have been, literally, made to order. It might have been thought that the ingenious scientists responsible for this development would have been people who refer to themselves as inorganic chemists—but not so. Of the approximately 1000 names in the author index only a mere handful are known to this reviewer as inorganic chemists, and three of these with impeccable credentials (M. Calvin, G. N. Lewis, and T. Moeller) actually appear in disguise as Colvin (p. 519), S. G. N. Lewis (p. 544), and Moeler (p. 2).

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Erratum

Vol. **10**, No. 4 (1968), in the article, "Studies on Pore Systems in Catalysts. XIV. Calculation of the Cumulative Distribution Functions for Slit-Shaped Pores from the Desorption Branch of a Nitrogen Sorption Isotherm," by J. C. P. Broekhoff and J. H. de Boer, pp. 391–400:

Page 395, Eq. (15b) should read:

$$\frac{d}{2} - t_a = \frac{2.02^5 + 16.11(1/t_a - 2d) + 1.483[\exp(-0.05685d) - \exp(-0.1137t_a)]}{\log(p_O/p_D)} \qquad (15b)$$