Adsorption and Collective Paramagnetism. By PIERCE W. SELWOOD. Academic Press, London and New York, 1962. *ix* + 189 pp. Price: $7.50.

Of late years there has been an increasing tendency to elucidate the adsorption characteristics of catalytic systems by measuring the influence of adsorption on their physical properties. This requires an understanding not only of the adsorption principles but also of the physical behavior of the system under consideration. Since catalytic systems are rather complicated, from a physical viewpoint, the surface chemist has generally to digress rather far into specialized physical literature.

With the present book the author, well known by his earlier book "Magnetochemistry," has made clear the possibilities and limitations of magnetic measurements on ferromagnetic metal-on-carrier systems, so that for this kind of research it is no longer necessary to consult original papers on the purely physical aspects of the subject, which is a rather tedious task. The appearance of this book gives reason to rejoice, the more so as the physical interpretation of the behavior of small ferromagnetic particles has only lately been settled and a great deal of the rather recent literature is still incorrect.

The book may be roughly divided into three parts. In the first part, comprising Chaps. I to IV, a concise and clear account is given of the knowledge essential to comprehend the magnetic and adsorption properties of metal-on-carrier systems. Chapter I (18 pp.) gives a short survey of chemisorption and the tools for investigating it. Chapter II (16 pp.) deals with magnetic phenomena, and Chap. III (15 pp.) with the magnetic properties of very small ferromagnetic particles. At the end of this chapter the determination of the size of small ferromagnetic particles is discussed. The rather complicated measurement of the saturation magnetization of ferromagnetics is extensively described in Chap. IV (16 pp.).

In the second part (Chaps. V to VII) the effect of hydrogen adsorption on the magnetic properties of small ferromagnetic particles is discussed. Chapter V (21 pp.) describes the effect of hydrogen adsorption on the saturation magnetization, while Chap. VI (14 pp.) reviews the measurements of the magnetization at low field strengths and not extremely low temperatures. Chapter VII (25 pp.) explains the influence of hydrogen on the low-field magnetization of small nickel and cobalt particles. In the discussion of the implications of these results for the bonding of hydrogen on the metal surface a clear account is given of the different interpretations of the slow adsorption of hydrogen on nickel-on-silica catalysts.

In the final part (Chaps. VIII to X) the adsorption of other gases is investigated by comparing the effect of their adsorption on the low-field magnetization with that of hydrogen. In Chap. VIII (17 pp.) this method is applied to the adsorption of hydrogen sulfide, cyclohexane, cyclohexene, and benzene. Especially the data on the hydrogenation of benzene permit of very interesting conclusions on the interaction of hydrogen and benzene on a nickel surface. In Chap. IX (15 pp.) a summary is given of investigations into the adsorption of ethane, ethylene, and acetylene on nickel. The much debated adsorption and hydrogenation of ethylene are critically discussed; here, too, a much deeper insight into these processes is gained. Finally, in Chap. X (19 pp.), a discussion is given of the adsorption of carbon dioxide, carbon monoxide, oxygen, nitrogen, argon, and krypton.

The author has given a very good account of the research he carried out with his co-workers at Northwestern University in Evanston the last few years; moreover he surveys competently the many conflicting interpretations of such subjects as hydrogen adsorption and ethylene hydrogenation. The list of references is very extensive and includes also important Polish papers that are not commonly accessible. This makes this book very interesting not only to those who perform magnetic measurements or intend to do so, but also to everyone who is engaged in chemisorption and catalytic problems.

For the sake of completeness some remarks have to be made. That hydrogen is not chemisorbed on nickel at −180°C (pp. 3, 108) is not generally accepted; field-emission and surface-potential evidence points to chemisorption below this temperature. The fact that Neugebauer did not find a decrease in saturation magnetization of rather thick evaporated nickel films on hydrogen adsorption, which is contrary to what is to be expected from the behavior of small nickel particles, is not explicitly mentioned. On p. 83 and p. 117, Broeder, van Reijen, Sachtler, and Schuit are made to assume that adsorption of one hydrogen atom decreases the saturation moment of nickel by 0.6 Bohr magneton, whereas they actually assume a decrease of 1.0 Bohr magneton per adsorbed hydrogen atom. Sachtler and Dorgelo's interpretation of their resistance measurements on p. 115 is not represented clearly. On p. 122 it is stated that Hollis and Selwood did their resonance experiments on cobalt, whereas they actually measured on nickel particles. Finally, the use of the symbol $f(v)$ to designate different things (p. 38 and p. 98) is confusing.

The make-up of the book is excellent; only the omission of the pressure–volume isotherm in Fig. 66 should not go unmentioned.

J. W. GEUS
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