disadvantage that the films are texturally complex and their surfaces are ill defined. In some cases, this defect can be partially reduced by working with films grown epitaxially on suitable supports. Other disadvantages are that the films cannot usually be heated to high temperatures and, since they cannot be cleaned, they can be used but once. On the other hand, they offer two important advantages. A clean evaporated film of almost any metal can be prepared whereas because of the need for cleaning the literature of the other two methods can give the impression that tungsten is the only known metal. The larger sample area of the evaporated film is often an advantage. The gettering capacity of the film offsets the effect of contaminants and the larger area considerably facilitates determination of the amount of chemisorption and the study of heterogeneous catalytic processes.

This treatise is aimed at chemical reactions (adsorption, heterogeneous catalysis, conversion to compounds) at clean metal surfaces. Primarily it treats work on evaporated, thin films, but correlations with metal surfaces of other origins are extensively introduced. Although the treatise is aimed finally at chemical reactions, the structure and growth of thin films are treated extensively and in three chapters from differing points of view. The chapter by J. W. Geus which deals with this is particularly thorough and penetrating.

Several chapters deal with adsorption phenomena. That by D. O. Hayward contains considerable theoretical background on theories of bonding as a background to a survey of the adsorption of diatomic molecules. It serves to update *Chemisorption*, second edition, 1964, by Hayward and B. M. W. Trapnell. The chapter by J. R. Anderson and B. R. Baker considers adsorption equilibria and rates of adsorption with rather heavy reliance upon the conventional formal methods of Langmuir adsorption. The treatment of surface heterogeneity is rather more interesting and useful. Geus provides another penetrating chapter on the electrical resistance of evaporated films and the effects thereon of chemisorption. L. H. Little has a critical survey of the use of infrared spectroscopy for the study of chemisorbed species.

In the sections dealing with chemical reactions, I. M. Ritchie considers the processes involved in the oxidation of metals and Anderson and Baker have a long chapter which well surveys the use of evaporated metal films for study of heterogeneous catalysis. Twenty years ago a Gordon Research Conference on Catalysis was apt to degenerate into sloganeering in which the evaporated metal film adepts disdainfully alluded to the "dirty, contaminated" surfaces of the workers with conventional catalysts and the latter referred disparagingly to the "impracticality" of thin metal films. In reading Anderson and Baker's chapter it is interesting to note how this debate has faded and how well the results with metal films and with supported Group VIII metals accord. The considerable sections of the chapter on mechanism are primarily from the point of view of Anderson's own theories—but that is fair enough.

There are also chapters by D. F. Klemperer and D. R. Rossington on experimental techniques and alloy films, respectively.

This treatise does a good job in attaining its objectives.

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Amorphous Matter

Electronic Processes in Non-Crystalline Materials. N. F. MOTT and E. A. DAVIS. Oxford University Press, New York, 1971. xiv, 438 pp., illus. $24. International Series of Monographs on Physics.

Until very recently solid state physics has been concerned almost exclusively with crystalline materials. Although most of the solid state physicist's time is spent studying deviations from perfect periodicity of the crystalline lattice, such as lattice vibrations, impurities, point defects, and dislocations, because these are essential for understanding the properties of crystals, this disorder is sufficiently small that it does not invalidate the fundamental concepts which are based on the translational symmetry of the crystal lattice. These concepts find their expression in the band theory, Brillouin zones, and the dynamics of the electronic crystal momentum. It is curious that modern textbooks of solids do not even mention semiconducting glasses or, indeed, amorphous substances in general. Why have noncrystalline materials been ignored for such a long time? The answer is probably that noncrystalline materials cannot be simply described as extremely disordered crystalline materials. The whole conceptual framework appears to be useless. Complete absence of long-range order demands that we find and invent new concepts with which the general laws governing the electronic processes in noncrystalline materials can be described. This is precisely the reason why this new field of solid state physics is exciting and challenging.

The field has received much impetus recently from the use of amorphous semiconductors in electrophotography, electronic and optical memory devices, and electronic switching and as infrared optical elements. Despite significant progress in characterizing and understanding noncrystalline materials during the past ten years the field is still in a pioneering stage similar to that of crystalline solid state physics in the early 1950's.

It was therefore a great surprise to find that this new book by Mott and Davis goes far beyond summarizing the present state of knowledge. Mott and Davis analyze the conceptual foundation of the field, develop a theoretical framework for transport processes in disordered materials, and propose simple physical models which are based on physical intuition and a thorough familiarity with the experimental results. The authors present a large quantity of well-selected experimental data on a variety of disordered systems. These include liquid metals, semimetals and semiconductors, impurity bands in crystalline semiconductors, amorphous films of metals and semiconductors, and semiconducting glasses. The experimental evidence is analyzed, interrelated, and interpreted within the theoretical framework developed.

This book demonstrates a symbiotic interdependence of theory and experiment so fruitful for a developing field of research. It therefore should be of great interest to students of physics in general and, in particular, to scientists who wish to investigate systems of even higher complexity, such as organic and biological matter. For students and researchers of noncrystalline materials this book will be, of course, an indispensable source and guide for many years to come.

How remarkable this book is can be appreciated only after recognizing that it is perhaps the most interesting of a long series of similar achievements of the senior author spanning a career of over 40 years.

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