by now classical methods for investigating the mechanisms of catalytic hydrogen and oxygen transfer reactions. The article by Farnsworth and Onchi deals with the significance of intensity vs voltage curves in the interpretation of low-energy electron diffraction results on surfaces. Applications to the interaction of N_2O and NO with the 100 planes of nickel metal are surveyed using the complementary techniques of mass spectroscopy. The lecture by Jansen describes the not-so-novel idea of the phenomena of superexchange applied to the elementary chemisorption process of small molecules on metals. Elementary calculations are carried out for a three-center problem which involves two centers with initially unpaired electrons. Application is made to the Pt-H_2 system, NiO, and the xenon fluorides. The introductory lectures serve their purpose well to review some of the well-known concepts of surface science and to stimulate the reader into reading the remainder of the book.

In the research papers the experimental techniques of field-emission microscopy (FEM), field-ion microscopy (FIM), ellipsometry, low-energy electron diffraction (LEED), field-effect and surface-photovoltage, and Auger electron analysis are rather completely discussed. The article by Müller on advances in FIM is beautifully illustrated with photographs of metal tips in the microscope. In this article the new atom-probe field-ion microscope is briefly discussed. A rather complete study of oxygen adsorption on clean CdS surfaces is presented by Many et al. with the use of the techniques of field-effect and surface-photovoltage measurements. Such chemisorption processes should exhibit interesting magnetic properties such as electron paramagnetic resonance of O^- or O_2^- species produced upon chemisorption.

Theoretical techniques include standard perturbation theory procedures (Jansen and Grimley), density matrix and random phase approximation methods (Gerlach), and scattering theory (Drauglis). The theoretical calculations seem to have been based for the most part, however, upon rather drastic assumptions such as the average energy denominator approximation of second-order perturbation theory. The published discussions following each lecture are spirited and informative. Especially well done is the concluding discussion with G. D. Halsey as chairman. The discussion by Zemel on the "bird-worm" characterization of surface science investigators is facetious but quite true. As noted in this discussion, unfortunately little attention was paid to magnetism, particularly to the techniques of nuclear and electronic magnetic resonance which seem to be capable of revealing new facts about the nature of surfaces and the gas-solid interface.

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Title Statistical Models in Engineering

Authors Gerald J. Hahn and Samuel S. Shapiro

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Reviewer Neil Cox

The purpose of the authors in writing this book, as stated in the Preface, was to show the engineer responsible for a product whose performance is subject to chance fluctuations just how to choose a reasonable statistical model and how to use this model in the solution of practical problems. Thus, their main concern was the use and manipulation of statistical models for representing engineering phenomena. In this task, the authors succeeded very well. The book is well written and contains no glaring typographical errors. It can be read by anyone with the minimum undergraduate engineering mathematics.

The authors state that no previous training in statistics is required; and in Chap. 2 they provide a review of the basic concepts of probability and distributional models. This reviewer can state that Chap. 2 makes for interesting and informative reading, even for those with a prior knowledge of statistical methods. Chapters 3 and 4 deal with distributions, continuous and discrete, respectively. Of the distributions used as engineering models, 11 continuous functions and 7 discrete functions are described, along with a summary of their applications. These two chapters alone are worth the price of the book.

Chapters 5 and 7 deal with the problem of describing the behavior of a system from knowledge of the system structure and the behavior of its components. Clearly this is a problem of paramount importance to the practicing engineer, and this book provides an understandable source for the necessary techniques. In Chap. 5, the exact method known as transformation of the variables is presented. Chapter 7 deals with the method of generation of system moments and the Monte Carlo simulation method.

In Chap. 6, there are discussed methods for fitting distributions to data in situations where the underlying physical phenomena are not well understood. One might wonder why this material was injected between the closely related Chaps. 5 and 7; however, this does not seriously detract from the continuity. Chapter 8, the final chapter, deals with methods of evaluating the adequacy of a chosen model by both graphical and analytical procedures.

In summary, this is a well written volume which contains much practical information in one compact place. I have found it useful in my own work, and, without reservation, I recommend it to the practicing engineer.

Neil Cox earned his BS in chemical engineering at the University of Texas and advanced degrees at the University of Wisconsin. In 1962, he joined the Department of Chemical Engineering of the University of Arizona where he teaches an undergraduate course on statistical methods and a senior-graduate course on experimental design. In 1965, as a participant in the Ford Foundation's Engineering Residency Program, he spent a year in industrial process development with duPont.