UNUSUALLY LUCID

Title Effects of Radiation on Semiconductors

Author Viktor Sergeevich Vavilov

Publisher Consultants Bureau Enterprises, Inc., 1965

Pages $xi + 225$

Price $15.00

Reviewer H. Y. Fan

This book deals with the effects of light waves and high-energy charged particles on semiconductors. The interaction between matter and electromagnetic waves lead to the absorption and dispersion of the waves and to electronic excitation and ion vibrations in the matter. Electronic excitation produces photoconductivity. The first two chapters treat light absorption and photoconductivity in semiconductors. Under a given excitation, the photoconductivity depends on the decay or recombination rate of the excess conduction electrons or holes. Photoconductive phenomena, and particularly the recombination effect discussed in connection with it in Chapter II, are important for the understanding of semiconductor devices.

Chapter III concerns the ionization effect of charged high-energy particles. The subject is basically important for the application of semiconductor detectors of such particles. Structural changes produced by energetic particles and their effects on the properties of the semiconductor are the subject of the third chapter which occupies about one-third of the book. Structural changes include lattice defects resulting from displacement of atoms from their regular positions, and foreign atoms on regular lattice sites resulting from nuclear reactions. Both types of structural changes and their effects are discussed. The discussion covers the effects of fast electrons, gamma rays, neutrons, and heavy charged particles. The material presented in this chapter should be useful for the application of semiconductor devices in the environment of such radiations.

Chapter IV treats the phenomena of light emission from semiconductors under the excitation of light or fast electrons. The conditions for obtaining stimulated emission are considered. This chapter seems to be of secondary interest for nuclear science.

This book is written by an expert who has applied optical and photoconductive measurements to the study of radiation damage of semiconductors with great success. The presentation is unusually lucid, making the material easily understandable. The reader will find the book useful and interesting without having to be a specialist in the field.

H. Y. Fan is Duncan Professor of Physics at Purdue University. He received his DSc from Massachusetts Institute of Technology in 1937. He was Assistant Professor, then Professor at the National Tsing Hua University, Kunming and Peiping, China, during the period 1937 to 1948. He joined the faculty at Purdue in 1948. His specialty is semiconductor physics, and his main research contributions have been on optical properties of semiconductors, and on radiation damage in semiconductors.

WHAT MAN HAS JOINED TOGETHER

Title Handbook of Electron Beam Welding

Authors R. Bakish and S. S. White

Publisher John Wiley & Sons, Inc., 1964

Pages $ix + 269$

Price $11.50

Reviewer Bruce M. MacPherson

This handbook gives the first practical dissertation of the welding process that utilizes electron-beam energy sources for joining, which in the last few years has become an established tool for industry. The authors have made a fair appraisal of the electron-beam welding process and the milestones of its brief history.

Commercial electron-beam welding equipment may be evaluated in two categories based on accelerating voltage—high- (150 kV), and low-voltage (15 to 40 kV). This book lists the commercial manufacturers and general specifications for their electron-beam welding equipment. Some analysis of the controversy over low- vs high-voltage electron-beam equipment can be derived from the data presented.

Although the authors have rightfully devoted large sections of the book to equipment and metallurgy, it should be understood that the process is in its infancy and that development, research, and engineering efforts in these two areas are indeed still needed, as noted by the numerous development programs that the government has sponsored, including one in the area of beryllium metal. The physical and mechanical metallurgy data of joints in beryllium, aluminum, titanium, steel, Zircalloy, columbium, molybdenum and tungsten are presented in this book. Even though the data presented are not complete due to the rapidly advancing technology in these areas, it should provide a useful guide to both newcomers and users seeking to broaden their areas of electron-beam welding application.

Beryllium is one of the more difficult metals to weld, and though beryllium has not been electron-beam welded with the success that has been obtained with the other metals and alloys covered in this book (the high-energy density electron beam normally associated with electron-beam welding has not been shown to be practical with