About the Reviewer: R. Louis Bradshaw received his degree in electrical engineering at Auburn University and has done graduate study at the University of Tennessee. He has been with the Oak Ridge National Laboratory since 1951. Since 1953 he has been with the Health Physics Division of ORNL and has worked on research projects relating to radioactive aerosols, environmental monitoring, and high-level waste disposal. Mr. Bradshaw presented one of the papers at the Vienna Symposium Ultimate Storage of High-Level Waste Solids and Liquids in Salt Formations *and was coauthor of a second paper* Economic Evaluation of Tank Storage and Pot Calcination of Power-Reactor Fuel Reprocessing Wastes.

Nuclear Power Technology. Edited by F. J. Pearson. Oxford University Press, (1963). 355 pp. 42s. net.

The editor describes this book as an outgrowth "of various courses of lectures on nuclear power given by several contributors, mainly at the College of Advanced Technology, Birmingham." In my opinion it suffers both from the fact that it is essentially a compilation of lectures rather than a carefully planned, well integrated book and from the fact that it is very strongly influenced by the directions of emphasis given nuclear power technology in the United Kingdom. It is understandable that local experiences would be reflected in such a composition and perhaps my reaction to some of the passages is the more negative because of long-term association with the program in the United States. However, I believe even other readers in the United Kingdom might question the general objectivity of statements such as the following:

Page 227 (on graphite as moderator) - "... except for some special reactors it is probably the most convenient material available."
Page 251 (on heavy water as a moderator) - "Its use is limited to small reactors because of the enormous expense of extracting..."
Page 254 - "The use of air (as coolant) is not possible at temperatures above 300° C as the oxygen attacks the graphite moderator."
Page 255 - "Water boils at too low a temperature for power production unless pressurized, and a pressurized system is expensive to construct and maintain."

These are but a few (and not the worst) of the many such statements noted throughout the text.

Some feeble effort at cross referencing material in different lectures is apparent; however, it falls far short of the editorial job needed to eliminate unnecessary duplication and provide smooth continuity. While not particularly important to understanding, the intermittent use of °F and °C in various chapters seems indicative of this weakness.

The date of the preface is October 1962, and the date of publication is June 1963; however, the material does not appear to have uniformity as of any particular time. For example, while note is taken of the lack of papers from the Soviet Union at the Melbourne meeting of the World Power Conference in October 1962, it is claimed (in another part of the same chapter) that the UK is the only country which "has won export contract." The list of Nuclear Power Reactors given as Appendix II suffers from similar evidence of inaccuracy even as of the time of final editing. Such obvious inconsistencies give rise to natural doubts about technical material which is more difficult to check in detail.

The purpose given for creation of this book is a valid one. The work does provide an introduction to the many branches of nuclear power technology and can be the basis for some readers gaining a better appreciation of the many problems involved. However, I believe that most knowledgeable American readers would find many of its evaluations biased almost to the point of distortion.

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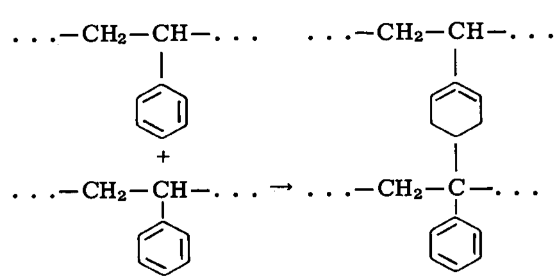
Effect of Ionizing Radiation on High Polymers. By T. S. Nikitina, E. V. Zhuravskaya, and A. S. Kuzminsky; 13th in a series of volumes of Russian Tracts on Advanced Mathematics and Physics. The present translation from the Russian to the English language by Scripta Technica, Inc., copyrighted by Gordon and Breach Science Publishers, Inc. in 1963.

As a pertinent general background for the material to follow on the effects of ionization, the authors treat briefly: the interaction of radiation and matter, the units of measurement, the sources of radiation, gamma rays, electrons, neutrons, x-rays, protons, deuterons, alpha-particles, fission fragments, and the general laws of the radiation chemistry of high polymers.

The radiochemical processes in the formation and various properties of polymers are discussed in their various aspects—such as cross-linking, degradation, solubility, molecular weight, liberation of gas, oxidation, physical properties, crystallinity, thermal expansion, electrical and mechanical characteristics, strength and elongation, permeability to gases, and the modulus of elasticity.

Examples of the type of coverage are: Polyethylene is the simplest polmer cross-linked by irradiation and consequently is characteristic for all polymers so cross-linked. The valuable properties acquired by polyethylene are increase in electrical stability at higher temperatures, and corrosive stability—for example, 100% H_2SO_4 and aqua regia oxidize only its surface. Its resistance to stress cracking and to chemicals is considerably increased. Its rubbery state and resistance to melting at higher temperature makes it useful in the manufacture of vessels for medical, pharmacological and food sterilization. It has maximum tensile strength 125-225 kg/cm^2; modulus of elasticity 1250-1400 kg/cm^2; percent elongation at breakage point 500-600; hardness R11; specific gravity 0.92; negligible water absorption; good stability in acids (except nitric) and in bases and in solvents below 60 C but swells in hydrocarbons and their Cl-derivatives at 60-100 C; resistance to aging in open air—should be protected from sunlight.

The presence of phenyl rings in polystyrene gives it high radiation stability. The doses necessary for its cross-linking are 1.5 to 2 times higher than those for polyethylene and rubber. Cross-linking is the predominant process in the irradiation of polystyrene but it does not ensue for some time after irradiation begins and degradation is first dominant. The hypothesis has been made that the phenyl group participates in the cross-linking and that hydrogen is not liberated, as:



Cross-linking begins to influence polystyrene even when only 0.6 bonds per molecule have been formed. Such samples retain their form and will not melt at 250 C. When three bonds are formed per each 100 monomers, the modulus of elasticity increases with rise in temperature of vitrification.

The author's general conclusions are: The analysis of the data shows that irradiation of high polymeric substances is accompanied by profound changes of the entire conglomerate of their properties. The basic directions of radiochemical processes in polymers—cross-linking or degradation—are uniquely determined by the nature of the polymer. However, a number of polymers exist in which both of these processes are equally probable.

The irradiation conditions (temperature, dose strength, phase relations in the polymer) are of secondary importance, and their effect is not sufficiently known at the present time.

Further studies in this direction will give a better understanding of the radiochemical processes taking place both in polymers and in other classes of chemical compounds and will permit the practical employment of ionizing radiation in the field of high polymeric materials.

This review covers the literature published in the USSR and abroad up until the end of 1958.

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About the Reviewer: Samuel C. Lind is now a consultant at the Oak Ridge National Laboratory. He was born in 1879; he received his Ph.D. degree at the University of Leipzig in 1905 and 4 honorary D.Sc. degrees since then. In his academic life he was instructor at the University of Michigan, Director of the School of Chemistry at Minnesota for 9 years and its Dean of Institute of Technology for 12. He has written three books on various phases of electrochemistry. He received the Nichols Metal Award, the Priestly Metal Award, and the Distinguished Service Award of the Minnesota Chapter of Sigma Xi. He is a member of the National Academy of Sciences, a past president of the American Chemical Society and of the Electrochemical Society, and was for 20 years the editor of the Journal of Physical Chemistry. *He fishes for trout in his spare time.*

Fracture of Solids: Proceedings of an International Conference Sponsored by the Institute of Metals Division, American Institute of Mining, Metallurgical, and Petroleum Engineers. Edited by D. C. Drucker and J. J. Gilman. Maple Valley, Washington, (August 21-29, 1962). 706 pp. $28.00.

The failure of real substances under loads far below the strength of perfect materials is an ever-present concern for design engineers and a fasci-