

these matters are under consideration by the Defence Research Policy Committee and the Advisory Council on Scientific Policy, it makes no further comment.

The Select Committee agrees with the opinion, which Sir Edward Appleton expressed at the British Commonwealth Scientific Conference last year, that it is far too early to decide what the ideal Government organisation for research should be, and the machinery for fostering scientific effort must remain for many years in a state of active development. That, however, does not exclude the need for closer study of the whole question of the organisation of scientific and industrial research in Great Britain, and indeed is a reason for further trial and experiment with the forms of institution best likely to achieve our purposes. There is general agreement, both in Great Britain and in the United States, that fundamental research is seldom a proper field for Government expenditure and that Government assistance is best given indirectly, through block grants to universities, research institutes and even individuals; but even here there may be room for inquiry as to whether there is in Britain a sufficiency of research institutions of the range and type to ensure that all branches of science are adequately covered. While the urgency of the present need for more and more production makes it essential to drive existing institutions to the utmost, the general unrest following a great war nevertheless provides both the right atmosphere for experiment with new ways of approach and the incentive to extract from each everything that can be of value for the future.

SYNTHETIC RUBBER

Butalastic Polymers

Their Preparation and Applications; a Treatise on Synthetic Rubbers. By Frederick Marchionna. Pp. vii+642. (New York: Reinhold Publishing Corporation, 1946.) 8.50 dollars.

THE development of synthetic rubber is one of the outstanding achievements of chemical industry in recent years. The chronicler of the story of this achievement is, however, faced with a multiplicity of difficulties. A comprehensive account must include, first the manufacture of the monomer, second the polymerization of the monomer, and third the fabrication and properties of a wide variety of articles made from rubber. The first part is a matter of large-scale industrial catalytic chemistry where the essential techniques are already well established in other fields of chemical engineering. The second is based on scientific principles, but is also compounded of much empiricism because there has not been time to go into these principles in an adequate manner so that the mechanism of polymerization is fully understood. The third is rubber technology applied to materials which have usually turned out to be rather more difficult to work with than natural rubber. Further, developments have mainly occurred in the United States, Germany and the U.S.S.R., and there has naturally been no interchange of information between these countries. Even if there had not been a world war, it is extremely doubtful whether the operators in these respective countries would have

divulged the 'know how' regarding these processes so that an author could write a critical summary of the present-day position.

Dr. Marchionna has therefore had to face very considerable difficulties in writing an up-to-date account of the subject. The book was written before much information became available through the Allied teams of investigators sent to Germany and before the vast amount of work done for the rubber research programme in the United States began to appear in the scientific literature. There was thus only available to the author a considerable volume of earlier published work on the attempts made to synthesize rubber-like materials and a host of patents relating to the possible processes for the manufacture of monomer, for the polymerization of monomers and for the working up of the rubbers so produced; but of course with little guidance as to their real worth or economic practicability. In view of this awkward state of affairs, it is impossible to prepare a critical account of the various phases of the subject or even to give a personal opinion of the relative merits of competing processes or the various types of rubber now commercially available.

The contents of the book are restricted to what the author conveniently terms butalastic polymers, that is to say, synthetic elastomers in which the repeating unit was originally a diene. The volume is divided into three parts. The first deals with laboratory and technical methods of making isoprene, dimethyl butadiene, butadiene and halogen derivatives of dienes. Although butadiene is now regarded as the most important diene, the space devoted to it is perhaps a little disproportionately small. Part 2 is devoted to the problems involved in polymerization. Here the emphasis is mainly on the methods found empirically for diene polymerization, and there is no general account of polymerization from the kinetic point of view. Again this is reasonable, because diene polymerization has not yet yielded to accurate kinetic methods in view of the many complications that arise, especially in emulsion or sodium polymerization. Unfortunately, the lack of published information has precluded a detailed description of the processes currently used in the United States. Part 3 describes the technology of synthetic rubber, dealing with the coagulation of the emulsion and the incorporation of the usual rubber-compounding agents. Then there are sections dealing with all the usual applications of rubber in industry, special note being paid to the properties of synthetic as contrasted with natural rubber. There are comprehensive indexes to the book, which is well produced and excellently printed.

This, then, is the first comprehensive attempt to give a balanced and connected account of an industry which started many years ago, developed very slowly indeed and did not really come into its own until war compelled a tremendous amount of scientific and technological effort to be brought to bear in order to make certain that synthetic rubber would, in fact, be a practical proposition. Dr. Marchionna has attained success in a very difficult task. Any shortcomings which the book possesses are in the main due to the information not being available. It is to be hoped that when a second edition is required the war-time experiences will be incorporated, so that the reader can then discover what indeed are the scientifically and economically satisfactory ways of making and manipulating synthetic rubber.

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