

MODERN SYNTHETIC RUBBERS*

THE development of Synthetic Rubber is one of the greatest achievements of chemical industry. Originally limited only to the very narrow field of rubber manufacture, synthetic rubber is now challenging, more and more, many of the domains in which natural rubber once reigned supreme. By 1948, capacity for production of synthetic rubber reached 1.2 million tons in U.S.A.

The author of the treatise under notice has discussed the question of raw material for the production of synthetic rubber at considerable length in Chapters VI and VII. Butadiene, by far the most important ingredient of a synthetic rubber molecule, is produced from alcohol by the Levedov process. The Russians obtained alcohol from potatoes and the Americans from grain; it is now obtained from ethylene which is present in the tail gases of petroleum refineries. The Germans concentrated on the use of acetylene obtained from calcium carbide as their principal raw material, and butadiene was obtained from acetylene, through aldol condensation of acetaldehyde.

The last three chapters of Part II form an interesting review of the various methods of polymerisation with particular reference to the manufacture of synthetic elastomers. But the paragraph on the mechanism of polymerisation at the end of Chapter VIII is too short. A little more information regarding the actual mechanism involved would have given it the completeness which it lacks at present.

The chapter on compounding in Part III of the book attempts to give too much information in too little space with the result that clarity suffers.

A good account is given, however, of the compounding and processing of various elastomers and of the properties of their vulcanisates in the chapters dealing with each individual elastomer. The manufacturing details of GR-S and Buna-S are also included.

Unlike natural rubber, unloaded GR-S compounds show inferior physical properties. Carbon black is absolutely essential in order to bring out the best characteristics of GR-S. The use of specially prepared furnace blacks for the reinforcement of GR-S in preference to channel black used for natural rubber opened a new chapter in the manufacture of rubber

grade carbon black. Although furnace black of the type of Kosmos is most suitable for good tensile properties of GR-S, lamp black has been found to be more advantageous for applications requiring high resilience. This is not explicitly stated in Chapter XIII, but a passing reference is made to the behaviour of lamp black in GR-S.

The fact that due to certain outstanding properties such as resistance to solvent action, gas permeability and fire, synthetic elastomers like Perbunan, Butyl rubber and Neoprene have come to stay in the field of rubber technology is clearly brought out.

The chemistry of synthetic rubbers is so closely related to that of plastics that sometimes it becomes difficult to say whether a product is a synthetic rubber or a plastic. Silicone is a typical example. Incidentally, it may be noted that no mention of this polymer is made by Barron in his book. Chapter XX is devoted to Polyvinyl plastics, mixtures of Perbunan and Polyvinyl chloride compounds, flex, tear and ozone resistance.

The new class of compounds 'Lactoprenes' serves as an indication that there are still possibilities of new synthetic elastomers being produced.

The last chapter where the properties of different elastomers are compared is very valuable for purposes of reference.

In the section on molecular weight of rubber (Chapter V), there is no reference to the recent work on molecular weight determinations of rubber. This is especially surprising. Also, there is no mention of 'Cold rubber' which is the latest version of GR-S, and which has been reported to compare very favourably with natural rubber.

On page 271, accelerators are defined as chemical compounds which 'hasten the rate of vulcanisation'. This reduction in time of vulcanisation is only one of the functions of an accelerator. The majority of accelerators profoundly influence the properties of the resulting vulcanisates. The statement in Chapter XI that in compounding the main object is 'to reduce costs without sacrificing quality' is open to question.

These are points which can be overlooked. The book is a valuable contribution to the literature on synthetic rubbers, and may be read with profit.

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* "Modern Synthetic Rubbers." (Chapman and Hall, 1949; pp. xix + 636. 45 sh.)