

25

Advances in Polymer Science

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With 55 Figures



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The Editors of Advances in Polymer Science extend their warmest felicitations to Dr. Maurice Huggins on the occasion of his eightieth birthday on September 19th, 1977. We are happy to dedicate this 25th Volume to him in recognition of his outstanding contributions to Polymer Science and to other branches of physical science.

He was, of course, quite unaware of our intention when he was persuaded to write a preface to this work, and we hope he will forgive us for presenting this volume to him, and his photograph to our readers, without prior permission.

Preface

The scientific literature has become so immense that it is an impossible task for anyone, by reading the original research reports, to become familiar with the background and current status of more than a very limited field. Even in a narrow area, only a few scientists are sufficiently knowledgeable and critical to be able to present the kind of review that will be most useful to others.

To newcomers in a scientific field, who have had neither the time to read nor the background to understand what they read, critical reviews by more experienced scientists are especially important. Such reviews help a newcomer to choose the direction of his own research and give him a firm basis on which to build.

A good review of a field will often give interesting and useful ideas to older scientists, already knowledgeable in other fields. Other scientists in the same field as that being reviewed can usually profit from careful study of a review, because the writer and the reader have different backgrounds, different evaluations of the relative importance of previous researches, and different ideas as to what should be done next.

Writing a review, like teaching a course, is also useful to the reviewer. He must study carefully the work of others. He must be critical, but fair, in reporting the results of both his own and others' work.

Reviews, such as those that have been published in *Advances in Polymer Science*, thus play a very important role in the education of scientists and therefore in the progress of science. How important this role is, of course, depends on the choice of the reviewers and the quality of their reviews. In my opinion, the editors of the volumes in this series have just cause to be proud of their record over the past 25 volumes.

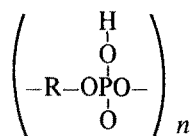
The current volume contains four reviews that will, I believe, maintain the high standard of previous years.

Davydov and Krentsel discuss the synthesis and properties of polyconjugated systems: organic polymers containing large sequences of alternating single- and double-bonds. In general, these substances differ from ordinary polymers in their ability to transfer polarization (of the electronic structure) in one region to a corresponding polarization in another, distant, region. This can result in interesting light absorption properties (photosensitivity), chemical properties (crosslinking), electrical conductivity, etc.

We are all familiar with chain polymers containing rings incorporated in the chains [cellulose and starch derivatives, poly(ethylene terephthalate), etc.] or attached to the chains (polystyrene) and with chain polymers produced from ring monomers [poly(ethylene oxide)], but few of us are acquainted with the quite extensive research that has been done on the formation and properties of similar polymers made from compounds containing the furan ring. In the present volume, Gandini ably discusses this subject. In view of the ready availability, from various plant residues, of 2-furaldehyde and the ability of this compound and its simple derivatives to enter into polymerization reactions, it is to be expected that it will not be long before interesting polymers from this source will become common and industrially important.

Polyacrylonitrile is one of the polymers of simple chemical composition that has proven most useful, especially in fibrous form. In certain respects, however, — with regard to the flexibility, resistance to softening and burning at high temperatures, dyeability, and electrical properties, for example — the fiber properties can be improved by modifications of the chemical composition and structure. Gabrielyan and Rogovin deal extensively with the methods and results of such modifications.

It is well known that the nucleic acids consist of chain polymers, with each chain corresponding to the general formula



or the polyanion obtained by removing protons from some of the OH groups. Each group here represented as R contains resonating pairs of hydrogen bonding groups that form strong double-hydrogen-bond bridges with similar groups, *e. g.*, in the other chain of a double helix structure.

Since these basic facts became known, a tremendous amount of research has been done on the structures and behaviors of these important substances. There has also been much research on the synthesis and study of other chain polyelectrolytes, containing hydrogen-bond-forming radicals (R) more-or-less like those in the natural nucleic acids. The primary aim of this research is, of course, to relate the behavior of the synthetic materials to the behavior of the natural ones. Okubo and Ise here present an excellent discussion on this research.

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Maurice L. Huggins

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