BOOK REVIEWS

Statistical Mechanics of Chain Molecules. Paul J. Flory.

The new book of Professor Paul Flory is an important event in polymer physics. An outstanding scientist who has made many valuable contributions to the field has written a book which not only completes the structure of statistical mechanics of chain molecules but contains much new information obtained during recent years—mainly by the author and his collaborators.

In the first chapter the spatial configurations of chain molecules are analyzed and most important theoretical models are treated. The book does not contain the details of the theory of excluded volume effect. However the general physical ideas about the "theta point" and "theta solvents" suggested by Flory two decades ago are exposed in a very clear and exact form. The same must be said about the temperature coefficients of dimensions of macromolecules. The interdependence of internal rotation in the chain is treated in the third chapter, containing an elegant mathematical description of the configurational statistics of chain molecules based both on rotational isomerism and on the concept of cooperativity. Very interesting and important results obtained recently by Flory and Jernigan concerning statistical properties of finite length chains are also included in this chapter. It ends with a very educational analysis of the difference between Markoff chains and polymeric chains with configurational statistics.

Chapter IV presents the mathematical treatment of the moments of chain molecules which are needed for the calculations of a series of geometrical and physical properties. This chapter contains also an important theory of Markoffian copolymers and an application of the theoretical physics of macromolecules to the chemistry of polymer synthesis. The method given by Flory will have important applications also in molecular biophysics and in the theory of biochemical evolution.

Chapter V is entitled "Symmetric Chains." It contains the detailed mathematical description of internal rotation in a series of most important chain molecules such as polymethylene, polytetrafluorethylene, polymeric sulfur, polyoxymethylene, polyoxyethylene, polydimethylsiloxane, polyamides, polyesters, polyisobutylene, and butadienes and isoprene polymers. This list shows that the general theory is not an abstract concept but an extremely useful tool for the analysis of the properties of most real polymers.

Chapter VI deals with the asymmetric stereo regular vinyl polymers. The reader will find here many new results such as, for instance, a refined theory of equilibrium configuration statistics. Chapter VII is particularly important not only for polymer science but also for molecular biology and biophysics since it deals with polypeptides, proteins, and related substances. Many new data were obtained by the author and his associates concerning the configurational properties of several amino acid residues and also of the lactic acid unit. The theory of average dimensions of copolypeptides and the theory of configurational transitions are also included in this chapter.

Chapter VIII treats the statistical distribution of configurations and contains the comparison of various model chains with real molecules. The last chapter is dedicated to the optical properties and to the radiation scattering of polymeric systems; it represents a valuable contribution to polymer physics.

This is a beautiful book which excels by the depths of its approach, by the clarity of its presentation, and by the abundance of stimulating ideas which will pave the way

for further developments. I cannot refrain from a brief personal remark: a scientist gets his greatest satisfactions when his ideas are acknowledged and further developed by his colleagues. It gives great pleasure to me and my associates that much of our work was used by Professor Flory when he created this new classic volume of polymer science.

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