

## BOOK REVIEWS

**Anelastic and Dielectric Effects in Polymeric Solids**, N. G. McCrum, B. E. Read, and G. Williams, Wiley, New York, 1967. pp. 617. \$25.00.

After a short introduction, the book goes quite directly to a discussion of the chemical and physical structure of individual polymer chains, and thence to the arrangement of molecules in amorphous and crystalline polymeric solids. Though brief, these discussions are both modern and lucid, covering especially well the subjects of rotational isomerism, spherulites and single crystals with chain folding, and crystallinity. The following chapters give clear discussions of the limiting moduli and static dielectric constant, and phenomenological theories of mechanical and dielectric relaxation.

For those interested in explanations at the molecular level, the excitement begins in the chapter on molecular theories of relaxation. Here the theory of Debye for small molecules is given first, followed by descriptions of the Rouse, Zimm, Van Beek and Hermans, Stockmayer, and Baur models, and Fuoss-Kirkwood models for chains in solution or otherwise amorphous states. The discussion on these theories is of necessity somewhat condensed, but still of considerable value, especially since the mode of presentation facilitates comparison of assumptions, basic structure, and results: The theoretical treatment of barrier models, applicable to rotation in crystals, and side-chain motions, is clear and very well done. The chapter on relaxation closes with a discussion of the "crankshaft" motion for secondary relaxations proposed by Schatzki and Boyer, and a treatment of local mode theories. This survey of the theories will provide the reader with theoretical interests a most useful summary of the state of the conceptual framework upon which molecular explanations of relaxations in polymers are based.

At this point, the authors insert a chapter on measurement methods which surpasses in quality anything this reviewer has seen in a similar space. This chapter sets the stage for a detailed survey of the dielectric and mechanical data on polymeric systems of general interest, e.g., methacrylate, hydrocarbon, halogen, polyamide, polyester, polycarbonate, and oxide polymers. In each case the discussion covers the  $\alpha$ ,  $\beta$ , and  $\gamma$  effects (if present) and goes into such items as molecular interpretation, effect of moisture, orientation, and crystallinity, where such items apply. This "tour of the polymers" comprises about one-half of the pagination, and represents a careful and worthwhile effort which is alone worth the price of the book.

The field is rapidly advancing at the present time, and certain interesting developments in interpretation (some due to the authors themselves) have occurred since the book went to press. This does not detract from the work in any important way. In fact, the book may be regarded as required reading for those interested in following new developments. The book is strongly recommended by both theoretical and experimental workers interested in the mechanical and dielectric properties of polymers.

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