

generally hits a happy medium with much detailed information or references to detailed information; yet each chapter is not cluttered with all that exists in each field.

I am sure that all analysts who have to deal with polymers will welcome this text since it presents in a concentrated form background and experience that is available for analyzing polymeric and related materials.

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**Adhesive Bonding of Reinforced Plastics.** HENRY A. PERRY. McGraw-Hill, New York, 1959. 267 pp. \$8.75.

As indicated in the Preface, this book is intended for all persons interested in the design and assembly of structures and products with adhesives, but with special attention to bonding of glass fiber-reinforced plastics to themselves. Bonding such laminates to other materials seems to have been neglected. In general, the author has succeeded in providing a small volume that covers the most important subjects from the advantages and limitations of adhesive bonding to the testing of completed joints. Greatest emphasis is given to the physical and engineering aspects of adhesive joints, both from a theoretical and an applied viewpoint. Relatively little attention is given to the chemistry of the polymeric systems.

Particularly important are chapters on Mechanics of Adhesive Joints and on Design of Adhesive Joints, subjects often neglected in other volumes on adhesives. One might readily question the desirability of separating the two subjects at opposite ends of the book. These subjects are covered rather well both from a fundamental, mathematical standpoint and from a more practical applied viewpoint. A chapter on the Statistical Point of View includes basic information on general statistical principles that could probably have been reduced or omitted. The chapter on Laminating Resins and Adhesives is generally adequate for the few resin systems actually used in the present laminated plastics industry. Only polyester and epoxy-resin adhesives are covered under laminating resins for preparing the adherends.

This probably represents the present state of the bonding of laminated glass-fiber base plastics although it limits the usefulness of the book for more general adhesive bonding techniques. Little attention is given to the permanence of the resin systems although extensive data are cited for strength tests at  $-65$ ,  $74$ , and  $160^{\circ}\text{F}$ .

Rheology of Adhesives is covered rather completely, including techniques for viscometry of non-Newtonian fluids.

Chapters on General Properties of Adhesives and Mechanical Testing of Adhesives include a number of the recent ASTM test procedures plus rather lengthy special treatment of more unusual properties such as electrical properties, and corrosivity of adhesives not generally available in other volumes. Considerable emphasis is given to the butt-joint specimens, which has had extensive study by the author for tensile, torsional shear, impact, and fatigue tests, and to dynamic loading tests of adhesive bonds. Brief attention is also given to ultrasonic bond tests.

The chapter on Adhesive Bonding Process Factors is handled in a brief and general fashion, and lacks data to illustrate the effects of variation in bonding techniques, such as time and temperature in precuring, curing, or in bonding pressures with actual adhesives on laminates. This brief treatment is unfortunate in that the overall content of the volume might suggest to a reader that the mechanical factors on joint design and stresses are much more important in determining final joint performance than the way in which the adhesive is selected and used in bonding. Information on equipment for adhesive bonding, however, is quite extensive and well illustrated, and includes a list of equipment suppliers. Quality Control of Adhesive Bonds includes a rather lengthy discussion of faults in the plastic laminate adherends since such faults may influence bonds to such adherends. Actual quality control of bonds is treated rather sketchily with emphasis largely on tests after bonding instead of control during the bonding process.

A glossary, largely based on ASTM nomenclature, will be helpful. Literature references are generally adequate. In general, the reader will find this book to be a useful source of information on modern adhesive bonding for structural applications, and particularly in bonding reinforced plastics.

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