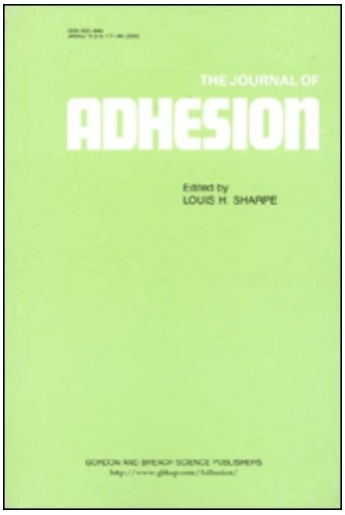

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BOOK REVIEWS

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Book Reviews

ANALYSIS AND TESTING OF ADHESIVE BONDS, by G. P. Anderson, S. J. Bennett and K. L. deVries. Academic Press, New York, 1977. 255 pp. ($21.00)

"The principal topic of this book is adhesive fracture mechanics" (p. 157), and the principal tool used is the finite element technique briefly described (and praised) on pages 122–126. Thus, "Fracture Mechanics based on the Final Element Technique and applied to Adhesive Joints" would probably be a more suitable title for this volume.

To calculate the fracture energy, the derivative dU/da is needed; U is the total strain energy of the adhesive joint, and a is the length of the fatal crack. To calculate U, the stress pattern in the joint must be known. Thus a considerable part of the work to be performed is identical with that prescribed for the computation of the breaking stress. Nevertheless, the authors "feel" that the "fracture-mechanics approach . . . is potentially much more satisfactory than a maximum stress criterion" (p. 102).

The experimental results presented all refer to tests in which dU/da was calculated. Many of these tests have been performed by the authors and their collaborators.

The two chapters in which the fracture energy is less prominent are Chapter 1 (containing a brief description of some ASTM tests) and Chapter 5 on Chemical and Physical Aspects of Adhesive Fracture. In the latter, it is pointed out that the first molecular layer, in the gas adsorption by solids, is attracted more firmly than the second, and so forth. "This model provides a basis from which to discuss approaches to improving bond strength" (p. 156).

Because only a small sector of the science of adhesive joints interests the authors, the total number of references is small: fewer than 200. The printing and binding look highly satisfactory, but the book is shorter than the number of pages would indicate. A full page of text contains only about 330 words, but there are not many such pages. Not only equations are numerous, but also 114 generous sketches and figures illustrate the text.

J. J. BIKERMAN

ADHESION AND THE FORMULATION OF ADHESIVES
by W. C. Wake. Applied Science Publishers, London 1976.

A comprehensive treatment of this very complex, multi-disciplinary subject is a formidable task which has usually been approached by editing contributions of many workers expert in their respective fields pertinent to studies of adhesion and the strength of bonded structures.

Dr. Wake demonstrated courage in writing a modestly-sized volume aimed at providing readers with diverse backgrounds a reasonable introduction to the subject.

An advantage for a single author is the opportunity to achieve balance and coherence usually lacking in collected works.

The author did not use this opportunity to its full advantage. The book lacks balance. For example, there is unnecessary detail in the section on Van der Waals forces and yet the important consequences of the Lifshitz approach and the relative ease with which it can be used as demonstrated through work of Ninham, Parsegian and Gingell has not been included. Important work with general validity is often not clearly distinguished from related but relatively inconsequential material.

His intended readers would have benefited had the author been more critical of work he reviewed and provided more personal viewpoints along with their rationale.

Part II of this book summarizes many practical aspects and serves as a useful introduction to adhesives and their applications. The chapter on environmental influences, however, would have been improved by introduction of the concepts of Bolger and Michaels on ionic and hydrogen bonding into the discussion on water sensitivity.

The book can be recommended as a very readable introduction to the subject, but readers experienced in the field, or expert in some of the specific disciplines involved will find a relatively large number of unsatisfactory generalizations or errors.

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ADHESION OF MELTS AND JOINING OF MATERIALS [Russian].
Yu. V. Naidich, ed. Naukova Dumka, Kiev, 1976. 96 pp. Rub. 0.86.

This is a collection of twenty short papers. The hapless term *adhesion* in the title means *wetting*. The first half of the book is devoted to wetting and surface

properties of melts and solids. The next section has the title "Contact interactions of high-melting compounds and extremely hard materials with melts". The last quarter deals with "Joining and formation of adhesive coatings; adhesion effects on technological processes of obtaining materials".

In this part, some interesting practical results are presented, namely: new methods of preparation of metal—quartz illuminators for low temperatures (Yu. V. Naidich *et al.*); a method for joining glasses with titanium alloys (V. I. Artem'ev *et al.*); joining of graphite with graphite and metals (V. M. Emelyanov); improvement in the imbibition of aluminum by bunches of carbon filaments (M. Kh. Shorshorov *et al.*); and the interaction of tungsten filaments with "high-carbon" matrices (V. N. Bulanov *et al.*).

It is impossible to abstract each of the papers in this review, but it is hoped that our abstract journals will notice the book and will render its contents a little more accessible to the English-reading scientists and engineers.

J. J. BIKERMAN