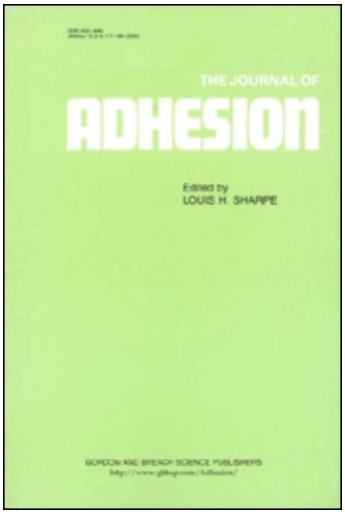

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A Review of: "Fracture Behaviour of Polymers, by A. J. Kinloch and R. J. Young, Applied Science Publishers, London and New York, 1983, 496 pp. $92.50"

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Book Review

FRACTURE BEHAVIOUR OF POLYMERS, by A. J. Kinloch and R. J. Young, Applied Science Publishers, London and New York, 1983, 496 pp. $92.50.

After considerable effort by many workers, it has at last become possible to integrate the concepts of fracture mechanics with our knowledge of the molecular behavior of polymers. This book, whose two authors have been among the leaders in the field, supplies a clear and thorough description of its current status. Many new developments are still to be expected, but this is likely to remain the definitive text on the subject for some time to come.

For readers of this Journal, it should be pointed out that many aspects of the fracture of adhesive bonds and fiber reinforced composites are outside the intended scope of the book. These areas are treated only with regard to the cohesive fracture of the polymer phase. Nevertheless, a grasp of the material presented is crucial for the understanding of the failure of any polymer based system.

An introductory chapter surveys aspects of polymer behavior which are relevant to fracture. Many topics are covered quite rapidly; readers lacking a fairly strong background in polymer science may find it desirable to supplement this discussion with one of the standard texts on polymers. The main body of the book is divided into two roughly equal sections, the first dealing with theory and experimental methods, while the second covers the application of these ideas to different classes of polymers. The five chapters on "Mechanics and Mechanisms" discuss, in turn, the molecular aspects of fracture, fracture mechanics, shear yielding, crazing, impact and fatigue. The chapters on "Materials" cover glassy thermosets and thermoplastics, crystalline polymers, rubbers and toughened multiphase polymers. Recently active areas, such as high strength organic fibers and the fracture of single crystal polymers are included. The dual approach

leads to a certain amount of repetition, largely for the sake of clarity. The extensive lists of reference for each chapter provide good coverage of important developments.

Two themes recur throughout. One of these is the competition between shear yielding and crazing as primary fracture mechanisms, depending on the circumstances and the material involved. The second is the relative effectiveness of different theoretical approaches, such as the kinetic theory of fracture, linear elastic fracture mechanics, "generalized" fracture mechanics, the Dugdale model, etc. in dealing with various situations. The discussions of theoretical models provide a well balanced description of their respective merits and limitations. The profusion of mathematical symbols necessary for this purpose has been handled in an especially clear and well-organized manner.

Two topics which this reviewer would have liked to have seen dealt with more fully were the interpretation of fracture surface markings and the role of environmental agents such as surfactants in crazing. One potentially confusing misprint was found: the labels on two of the curves in Figure 9.1 have apparently been interchanged.

This volume will fill a real need for scientists and engineers concerned with the structural behavior of polymers, and should be deservedly popular. Its lucidity, complete coverage of the subject and careful attention to detail are especially to be commended.

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