

Introduction

ASTM Committee E-24 is responsible for test method standardization as well as technology development in the field of fracture testing, and Subcommittee E24.01 has the specific responsibility for fracture-mechanics test methods. The latter is the direct descendent of the original Special ASTM Committee on Fracture Testing which started in 1959 to search for means of characterizing the resistance of thin sheet materials to the catastrophic type of fracture which takes place without warning and at stresses below those anticipated from the usual engineering properties. Several test methods have already been developed by E24.01, notably E 338 on Sharp-Notch Tensile Testing of Sheet, E 399 on Plane-Strain Fracture Toughness Testing, E 561 on Resistance Curve Determination, and E 602-76T on Sharp-Notch Tension Testing with Cylindrical Specimens and a number of others are in process.

This volume represents a state-of-the-art report on developments in the field of fracture mechanics test methods within E24.01. These papers were part of an E24.01 sponsored Symposium held in St. Louis in May 1976, and include all of the aspects of work within the Subcommittee except that on testing of beryllium.

The continuing review of the validity requirements in ASTM Method E 399 is the subject of the paper by Kaufman. The generation of data which provide information on the effects of individual specimen geometry and testing procedure factors which are not compounded by other variables is slow, but such data may lead eventually to some relaxation or modification of the validity criteria which add to the cost and workability rate of K_{Ic} data. The papers by Underwood and Kendall and by Gross and Srawley presage a major change in ASTM Method E 399, namely, the inclusion of a C-shaped specimen with the already present bend and compact specimens; this will answer the need for suitable specimens for cylindrical and tubular components. With regard to resistance curves, the development of the most precise calibrations for the various types of specimens employed are described by McCabe and Sha for incorporation into ASTM Method E 561.

In the area of new methods, Landes and Begley presented the first complete guidelines for J-integral determination, guidelines which will likely form the basis of a future recommended practice or standard method.

The subject of part-through-crack testing is represented herein by a reprinting of T. N. Orange's paper from the September 1975 *Journal of Testing and Evaluation*. A review of this subject was presented at the Symposium by C. E. Feddersen, but a text of that review is not available.

With regard to screening tests, the paper by Shannon, Brown, and Donald describes the Metal Properties Council funded study of a new one-side fatigue-cracked, edge-notched specimen being considered to replace the center cracked (CC) specimen in ASTM Method E 338. The complexity of specimen preparation for the latter has resulted in limited use, and a simpler specimen is seen to be needed particularly for very high-strength materials. For aluminum alloys, the machined edge-notch (EN) specimen in ASTM Method E 338 has been rather widely used for screening and quality control, and little change is expected here except perhaps a broadening of thickness limits.

In the area of newer methods for screening tests, Jones and Bucci et al, updated the information on the use of notched cylindrical specimens from both the viewpoint of testing and application. This method has been published in the gray pages of Part 10 of ASTM Standards for several years and is now advanced to a Tentative Standard with the designation E 602-76T. Another new screening test is covered in two papers from Succop et al, who describe the use of precracked Charpy test to indicate plane-strain fracture toughness; some spinoff to new standard methods in this area is expected within a couple of years.

Publication of these papers together with the test methods involved provides the most complete document available in the field of fracture toughness testing, and as such it should be of great value to materials research and design engineers.

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