

STP 1296

Fatigue and Fracture Mechanics: 27th Volume

*Robert S. Piascik, James C. Newman, Jr.,
and Norman E. Dowling, Editors*

ASTM Publication Code Number (PCN):
04-012960-30



ASTM
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Printed in the U.S.A.

Contents

Overview	ix
PROFESSOR J. L. SWEDLOW MEMORIAL LECTURE	
Life Prediction: A Case for Multidisciplinary Research—ROBERT P. WEI	3
ELASTIC-PLASTIC FRACTURE	
Application of a J-Q Model for Fracture in the Ductile-Brittle Transition— JOHN D. LANDES	27
Constraint Effect in Brittle Fracture—JUH-JIN CHAO AND XIANG H. ZHANG	41
T_c^* Integral Under Plane Stress Crack Growth—YOSHIKA OMORI, HIROSHI OKADA, LEONG MA, SATYA N. ATLURI, AND ALBERT S. KOBAYASHI	61
Application of Constraint Modeling to Evaluation of Crack Growth Experi- ments—JONAS FALESKOG, FRED NILSSON, SKENDER SHEHU, AND HANS ÖBERG	72
Prediction of Stable Tearing and Fracture of a 2000-Series Aluminum Alloy Plate Using a CTOA Criterion—D. S. DAWICKE, R. S. PIASCIK, AND J. C. NEWMAN, JR.	90
Effects of Mixed Mode I/II Loading and Grain Orientation on Crack Initiation and Stable Tearing in 2024-T3 Aluminum—BYRON E. AMSTUTZ, MICHAEL A. SUTTON, DAVID S. DAWICKE, AND MICHAEL L. BOONE	105
The Energy Dissipation Rate—A New Tool to Interpret Geometry and Size Effects—OTMAR KOLEDNIK, GUOXIN SHAN, AND DIETER F. FISCHER	126
Effects of Crack Surface Morphology on Fracture Behavior under Mixed Mode I/III Loading—K. JIMMY HSIA, TONG-LIANG ZHANG, AND DARRELL F. SOCIE	152
An Analytical Investigation of the Effect of Crack Depth (a) and Crack Depth to Width (a/W) Ratio on the Fracture Toughness of A533-B Steel— JEFFREY A. SMITH AND STANLEY T. ROLFE	175
Ductile Tearing of Welded Structural Details—MICHAEL L. GENTILCORE AND ROBERT J. DEXTER	201
An Experimentally Verified Finite Element Study of the Stress-Strain Response of Crack Geometries Experiencing Large-Scale Yielding—TINA L. PANONTIN AND SHERI D. SHEPPARD	216

Analysis of Warm Prestress Data—BRUCE D. MACDONALD, GEORGE T. EMBLEY,
HUGO IRIZARRY-QUINONES, WALLY J. MCAFEE, DONALD E. MCCABE,
PAUL D. SMITH, AND J. W. WUTHRICH

243

FATIGUE

- The Three Thresholds for Fatigue Crack Propagation**—KEITH J. MILLER 267
- How Fatigue Cracks Grow, Interact with Microstructure, and Lose Similitude**—
DAVID L. DAVIDSON 287
- Short Crack Growth Behavior**—K. SADANANDA AND A. K. VASUDEVAN 301
- A Practical Methodology for Elastic-Plastic Fatigue Crack Growth**—
R. CRAIG McCLUNG, G. GRAHAM CHELL, DALE A. RUSSELL, AND GEORGE E. ORIENT 317
- Effect of Absorbed Hydrogen on the Microstructure in the Vicinity of Near-
Threshold Fatigue Cracks in Low-Alloy Steel**—JENS HELDT AND
HELMUT KAESCHE 338
- S-N Curve for Crack Initiation and an Estimate of Fatigue Crack Nucleus
Size**—C. Y. YANG, P. K. LIAW, S. S. PALUSAMY, AND W. REN 352

ADVANCED MATERIALS AND APPLICATIONS

- Fracture Analysis of Full-Thickness Clad Beam Specimens**—JANIS A. KEENEY,
B. RICHARD BASS, AND WALLACE J. MCAFEE 367
- The Analysis of Underclad Cracks in Large-Scale Tests Using the Local Approach
to Cleavage Fracture**—DOMINIQUE MOINEREAU AND GILLES ROUSSELIER 387
- The Effect of Cyclic Loading During Ductile Tearing on the Fracture Resistance
of Nuclear Pipe Steels**—DAVID L. RUDLAND AND FREDERICK BRUST 406
- Experimental Investigation of Mismatched Weld Joint Performance**—
ROBERT L. TREGONING 427
- Fracture Testing of Large-Scale Thin-Sheet Aluminum Alloy**—ROLAND DEWIT,
RICHARD J. FIELDS, SAMUEL R. LOW III, DONALD E. HARNE, AND TIM FOECKE 451
- Resistance Spot Weld Failure Loads and Modes in Overload Conditions**—
STEVE ZUNIGA AND SHERI D. SHEPPARD 469
- Fatigue Response of Perforate Titanium for Application in Laminar Flow
Control**—JENNIFER L. MILLER, JAMES C. NEWMAN, JR., AND W. STEVEN JOHNSON 490
- Fatigue Crack Growth Damage in Elastomeric Materials**—CLAUDE BATHIAS,
KARIME LEGORJU, CHUMING LU, AND LUC MENABEUF 505

ANALYTICAL METHODS

Boundary Element/Dislocation Density Methodology for Analysis of Cracks in Anisotropic Solids —D. HEIM, L. XIAO, AND M. E. MEAR	517
Stress Intensity Factor Calibration of Edge-Notched Beam —WALTER H. GERSTLE, LARY R. LENKE, AND GWANGHEE HEO	530
Elastic Analysis of the Interaction Between Two Surface Cracks —LIAN KUI SUN, LI ZHANG, AND HONG QIN	550
A Three-Dimensional Weight Function Method—Evaluation and Applications —WEI ZHAO, JAMES C. NEWMAN, JR., AND MICHAEL A. SUTTON	563
Simple Two- and Three-Dimension Adhesive Finite Elements for Stress Analysis and Energy Release Rate Calculations in Adhesively Bonded Joints —DAVID A. DILLARD, MARK W. TAYLOR, RAUL ANDRUET, AND SIEGFRIED M. HOLZER	580
Analysis of Fatigue Crack Growth in Pin-Loaded Lug Joints Under Inelastic Deformations —RAGHU V. PRAKASH, K. N. RAJU, K. SATISH KUMAR, B. DATTA GURU, AND T. S. RAMAMURTHY	598
An Efficient Method for Calculating Multiaxial Elasto-Plastic Notch Tip Strains and Stresses under Proportional Loading —W. REINHARDT, A. MOFTAKHAR, AND G. GLINKA	613
Indexes	631