

Contents

Introduction	1
FATIGUE CRACK GROWTH STUDIES	
Effect of Biaxial Stresses on Crack Growth—A. F. LIU, J. E. ALLISON, D. F. DITTMER, AND J. R. YAMANE	5
Fatigue Crack Growth Threshold in Mild Steel Under Combined Loading— L. P. POOK AND A. F. GREENAN	23
Sequence Effects on Fatigue Crack Propagation; Mechanical and Micro- structural Contributions—H. NOWACK, K. H. TRAUTMANN, K. SCHULTE, AND G. LÜTJERING	36
Variations in Crack Growth Rate Behavior—M. E. ARTLEY, J. P. GALLAGHER, AND H. D. STALNAKER	54
Application of Fracture Mechanics to Damage Accumulation in High Temperature Fatigue—M. J. DOUGLAS AND A. PLUMTREE	68
Cryogenic Effects on the Fracture Mechanics Parameters of Ferritic Nickel Alloy Steels—R. L. TOBLER, R. P. MIKESELL, AND R. P. REED	85
Evaluation of Temperature Effects on Crack Growth in Aluminum Sheet Material—D. E. PETTIT AND J. M. VAN ORDEN	106
Effects of Temperature and Frequency on the Fatigue Crack Growth Rate Properties of a 1950 Vintage CrMoV Rotor Material—T. T. SHIH AND G. A. CLARKE	125
Structural Memory of Cracked Components Under Irregular Loading— H. FÜHRING AND T. SEEGER	144
Effect of the Active Plastic Zone on Fatigue Crack Growth Rates— GUNTER MARCI	168
A Comparative Experimental Study on the Fatigue Crack Closure Behavior Under Cyclic Loading for Steels and Aluminum Alloys—J. A. VAZQUEZ, AUGUSTO MORRONE, AND J. C. GASCO	187
Effect of Residual Stresses on Fatigue Crack Growth in Steel Weldments Under Constant and Variable Amplitude Loads—GRZEGORZ GLINKA	198
Role of Crack-Tip Stress Relaxation in Fatigue Crack Growth—A. SAXENA AND S. J. HUDAQ, JR.	215
Crack Closure During Fatigue Crack Propagation—W. J. D. SHAW AND I. LE MAY	233

Fatigue at Notches and the Local Strain and Fracture Mechanics Approaches—	
N. E. DOWLING	247
A Strain Based Intensity Factor Solution for Short Fatigue Cracks Initiating from Notches—	
M. H. EL HADDAD, K. N. SMITH, AND T. H. TOPPER	274
Crack Initiation in a High-Strength Low-Alloy Steel—	
B. L. BRAGLIA, R. W. HERTZBERG, AND RICHARD ROBERTS	290
Effect of Spherical Discontinuities on Fatigue Crack Growth Rate Performance—	
W. G. CLARK, JR.	303
Prediction of Fatigue Crack Growth Under Spectrum Loads—	
A. E. GEMMA AND D. W. SNOW	320

SURFACE FLAWS

Semi-Elliptical Cracks in a Cylinder Subjected to Stress Gradients—	
J. HELIOT, R. C. LABBENS, AND A. PELLISIER-TANON	341
Stress Intensity Factor Solutions for Internal Longitudinal Semi-Elliptical Surface Flaws in a Cylinder Under Arbitrary Loadings—	
J. J. MCGOWAN AND M. RAYMUND	365
Theoretical and Experimental Analysis of Semi-Elliptical Surface Cracks Subject to Thermal Shock—	
G. YAGAWA, M. ICHIMIYA, AND Y. ANDO	381
Growth of Part-Through Cracks—	
L. HODULAK, H. KORDISCH, S. KUNZELMANN, AND E. SOMMER	399
Stress Intensity Factors for Two Symmetric Corner Cracks—	
I. S. RAJU AND J. C. NEWMAN, JR.	411
Influence of Flaw Geometries on Hole-Crack Stress Intensities—	
C. W. SMITH, W. H. PETERS, AND S. F. GOU	431

EXPERIMENTAL FRACTURE MECHANICS— K_{lc} , J_{lc} , SPECIMEN GEOMETRY EFFECTS, AND EXPERIMENTAL TECHNIQUES

Variation of Fracture Toughness with Specimen Geometry and Loading Conditions in Welded Low Alloy Steels—	
A. PENELON, M. N. BASSIM, AND J. M. DORLOT	449
J_{lc} Results and Methods with Bend Specimens—	
J. H. UNDERWOOD	463
Investigation of Specimen Geometry Modifications to Determine the Conservative, J_I-R Curve Tearing Modulus Using the HY-130 Steel System—	
J. P. GUDAS, J. A. JOYCE, AND D. A. DAVIS	474
An Experimental Study of the Crack Length/Specimen Width (a/W) Ratio Dependence of the Crack Opening Displacement (COD) Test Using Small-Scale Specimens—	
P. M. S. T. DE CASTRO, J. SPURRIER, AND P. HANCOCK	486

Dynamic Photoelastic and Dynamic Finite Element Analyses of Polycarbonate Dynamic Tear Test Specimens—S. MALL, A. S. KOBAYASHI, AND Y. URABE	498
Effect of Specimen Geometry on Crack Growth Resistance—S. J. GARWOOD	511
Single-Edge-Cracked Crack Growth Gage—J. A. ORI AND A. F. GRANDT, JR.	533
Measurement of Crack-Tip Stress Distributions by X-Ray Diffraction—J. E. ALLISON	550
Correlations Between Ultrasonic and Fracture Toughness Factors in Metallic Materials—ALEX VARY	563

SPECIAL TOPICS

Analysis of Load-Displacement Relationships to Determine J-R Curve and Tearing Instability Material Properties—HUGO ERNST, P. C. PARIS, MARK ROSSOW, AND J. W. HUTCHINSON	581
Path Dependence of J in Three Numerical Examples—M. E. KARABIN, JR., AND J. L. SWEDLOW	600
Description of Stable and Unstable Crack Growth in the Elastic Plastic Regime in Terms of J, Resistance Curves—C. E. TURNER	614
Strain Energy Release Rate Method for Predicting Failure Modes in Composite Materials—R. S. WILLIAMS AND K. L. REIFSNIDER	629
An Analysis of Tapered Double-Cantilever-Beam Fracture Toughness Test for Adhesive Joints—S. S. WANG	651
Analytical Modeling and ND Monitoring of Interlaminar Defects in Fiber-Reinforced Composites—R. L. RAMKUMAR, S. V. KULKARNI, R. B. PIPES, AND S. N. CHATTERJEE	668
Stress Intensity Factors for a Circular Ring with Uniform Array of Radial Cracks Using Cubic Isoparametric Singular Elements—S. L. PU AND M. A. HUSSAIN	685
Interpretations of Crack Surface Topologies for Poly(Vinyl Chloride)—E. M. SMOLEY	700

ENGINEERING APPLICATIONS

Experimental Determination of K_I for Hollow Rectangular Tubes Containing Corner Cracks—M. E. McDERMOTT AND R. I. STEPHENS	719
Fracture Analysis of a Pneumatically Burst Seamless-Steel Compressed Gas Container—B. W. CHRIST, J. H. SMITH, AND G. E. HICHO	734
Crack Growth in Externally Flawed, Autofrettaged Thick-Walled Cylinders and Rings—J. A. KAPP AND R. EISENSTADT	746
Estimating Fatigue Crack Propagation Lives at the Test Site—D. R. GALLIART	757
On the Cup and Cone Fracture of Tensile Bars—B. KONG AND P. C. PARIS	770

Summary 783

Index 789