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Nota di contenuto	Fatigue Crack Propagation in Metals and Alloys; Foreword; Contents; Symbols and Abbreviations; 1 Introduction; 2 Basic Concepts of Metal Fatigue and Fracture in the Engineering Design Process; 2.1 Historical Overview; 2.2 Metal Fatigue, Crack Propagation and Service-Life Prediction: A Brief Introduction; 2.2.1 Fundamental Terms in Fatigue of Materials; 2.2.2 Fatigue-Life Prediction: Total-Life and Safe-Life Approach; 2.2.3 Fatigue-Life Prediction: Damage-Tolerant Approach; 2.2.4 Methods of Fatigue-Life Prediction at a Glance; 2.3 Basic Concepts of Technical Fracture Mechanics 2.3.1 The K Concept of LEFM2.3.2 Crack-Tip Plasticity: Concepts of Plastic-Zone Size; 2.3.3 Crack-Tip Plasticity: The J Integral; 3 Experimental Approaches to Crack Propagation; 3.1 Mechanical Testing; 3.1.1 Testing Systems; 3.1.2 Specimen Geometries; 3.1.3 Local Strain Measurement: The ISDG Technique; 3.2 Crack-Propagation Measurements; 3.2.1 Potential-Drop Concepts and Fracture Mechanics Experiments; 3.2.2 In Situ Observation of the Crack Length; 3.3

Methods of Microstructural Analysis and Quantitative Characterization of Grain and Phase Boundaries
3.3.1 Analytical SEM: Topography Contrast to Study Fracture Surfaces3. 3.2 SEM Imaging by Backscattered Electrons and EBSD; 3.3.3 Evaluation of Kikuchi Patterns: Automated EBSD; 3.3.4 Orientation Analysis Using TEM and X-Ray Diffraction; 3.3.5 Mathematical and Graphical Description of Crystallographic Orientation Relationships; 3.3.6 Microstructure Characterization by TEM; 3.3.7 Further Methods to Characterize Mechanical Damage Mechanisms in Materials; 3.4 Reproducibility of Experimentally Studying the Mechanical Behavior of Materials
4 Physical Metallurgy of the Deformation Behavior of Metals and Alloys4.1 Elastic Deformation; 4.2 Plastic Deformation by Dislocation Motion; 4.3 Activation of Slip Planes in Single- and Polycrystalline Materials; 4.4 Special Features of the Cyclic Deformation of Metallic Materials; 5 Initiation of Microcracks; 5.1 Crack Initiation: Definition and Significance; 5.1.1 Influence of Notches, Surface Treatment and Residual Stresses; 5.2 Influence of Microstructual Factors on the Initiation of Fatigue Cracks; 5.2.1 Crack Initiation at the Surface: General Remarks
5.2.2 Crack Initiation at Inclusions and Pores5.2.3 Crack Initiation at Persistent Slip Bands; 5.3 Crack Initiation by Elastic Anisotropy; 5.3.1 Definition and Significance of Elastic Anisotropy; 5.3.2 Determination of Elastic Constants and Estimation of the Elastic Anisotropy; 5.3.3 FE Calculations of Elastic Anisotropy Stresses to Predict Crack Initiation Sites; 5.3.4 Analytical Calculation of Elastic Anisotropy Stresses; 5.4 Intercrystalline and Transcrystalline Crack Initiation; 5.4.1 Influence Parameters for Intercrystalline Crack Initiation
5.4.2 Crack Initiation at Elevated Temperature and Environmental Effects

Sommario/riassunto

This comprehensive overview of the whole field of fatigue and fracture of metallic materials covers both the theoretical background and some of the latest experimental techniques. It provides a summary of the complex interactions between material microstructure and cracks, classifying them with respect to the overall damage process with a focus on microstructurally short cracks and dynamic embrittlement. It furthermore introduces new concepts for the numerical treatment of fatigue microcrack propagation and their implementation in fatigue-life prediction models.This comprehensive overview of t