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| Nota di bibliografia    | Includes bibliographical references at the end of each chapters and index.  |
| Nota di contenuto       | Cover; Title Page ; Contents; ACKNOWLEDGEMENTS; CHAPTER 1. INTRODUCTION ON VERY HIGH CYCLE FATIGUE; 1.1. Fatigue limit, endurance limit and fatigue strength; 1.2. Absence of an asymptote on the SN curve; 1.3. Initiation and propagation; 1.4. Fatigue limit or fatigue strength; 1.5. SN curves up to 10 <sup>9</sup> cycles; 1.6. Deterministic prediction of the gigacycle fatigue strength; 1.7. Gigacycle fatigue of alloys without flaws; 1.8. Initiation mechanisms at 10 <sup>9</sup> cycles; 1.9. Conclusion; 1.10. Bibliography; CHAPTER 2. PLASTICITY AND INITIATION IN GIGACYCLE FATIGUE<br>2.1. Evolution of the initiation site from LCF to GCF<br>2.2. Fish-eye growth; 2.2.1. Fracture surface analysis; 2.2.2. Plasticity in the GCF regime; 2.3. Stresses and crack tip intensity factors around spherical and cylindrical voids and inclusions; 2.3.1. Spherical cavities and inclusions; 2.3.2. Spherical inclusion; 2.3.3. Mismatched inclusion larger than the spherical cavity it occupies; 2.3.4. Cylindrical cavities and inclusions; 2.3.5. Cracking from a hemispherical surface void<br>2.3.6. Crack tip stress intensity factors for cylindrical inclusions with misfit in both size and material properties<br>2.4. Estimation of the fish-eye formation from the Paris-Hertzberg law; 2.4.1. ""Short crack"" number of cycles; 2.4.2. ""Long crack"" number of cycles; 2.4.3. ""Below |

threshold" number of cycles; 2.5. Example of fish-eye formation in a bearing steel; 2.6. Fish-eye formation at the microscopic level; 2.6.1. Dark area observations; 2.6.2. "Penny-shaped area" observations; 2.6.3. Fracture surface with large radial ridges; 2.6.4. Identification of the models; 2.6.5. Conclusion  
2.7. Instability of microstructure in very high cycle fatigue (VHCF)2.8. Industrial practical case: damage tolerance at 109 cycles; 2.8.1. Fatigue threshold in N18; 2.8.2. Fatigue crack initiation of N18 alloy; 2.8.3. Mechanisms of the GCF of N18 alloy; 2.9. Bibliography; CHAPTER 3. HEATING DISSIPATION IN THE GIGACYCLE REGIME; 3.1. Temperature increase at 20 kHz; 3.2. Detection of fish-eye formation; 3.3. Experimental verification of  $N_f$  by thermal dissipation; 3.4. Relation between thermal energy and cyclic plastic energy  
3.5. Effect of metallurgical instability at the yield point in ultrasonic fatigue3.6. Gigacycle fatigue of pure metals; 3.6.1. Microplasticity in the ferrite; 3.6.2. Effect of gigacycle fatigue loading on the yield stress in Armco iron; 3.6.3. Temperature measurement on Armco iron; 3.6.4. Intrinsic thermal dissipation in Armco iron; 3.6.5. Analysis of surface fatigue crack on iron; 3.7. Conclusion; 3.8. Bibliography; INDEX

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## Sommario/riassunto

Is there a fatigue limit in metals? This question is the main focus of this book.<br /> Written by a leading researcher in the field, Claude Bathias presents a thorough and authoritative examination of the coupling between plasticity, crack initiation and heat dissipation for lifetimes that exceed the billion cycle, leading us to question the concept of the fatigue limit, both theoretically and technologically.<br /> This is a follow-up to the Fatigue of Materials and Structures series of books previously published in 2011.<br /> Contents 1. Introduction on Very High Cycle Fatigue.<br /> 2.

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