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Nota di contenuto	Strained Metallic Surfaces; Contents; Introduction; 1 Peculiarities of the Metallic Surface; 1.1 Surface Energy and Surface Stress; 1.2 Crystal Structure of a Surface; 1.3 Surface Defects; 1.4 Distribution of Electrons near the Surface; 1.4.1 Model of Free Electrons in Solids; 1.4.2 Semi-Infinite Chain; 1.4.3 Infinite Surface Barrier; 1.4.4 The Jellium Model; 1.5 Summary; 2 Some Experimental Techniques; 2.1 Diffraction Methods; 2.1.1 The Low-Energy Electron Diffraction Method; 2.1.2 The Reflection High-Energy Electron Diffraction Method; 2.1.3 The X-ray Measurement of Residual Stresses 2.1.3.1 Foundation of the Method2.1.3.2 Experimental Installation and Precise Technique; 2.1.4 Calculation of Microscopic Stresses; 2.2 Distribution of Residual Stresses in Depth; 2.3 The Electronic Work Function; 2.3.1 Experimental Installation; 2.3.2 Measurement Procedure; 2.4 Indentation of Surface. Contact Electrical Resistance; 2.5 Materials under Investigation; 2.6 Summary; 3 Experimental Data on the Work Function of Strained Surfaces; 3.1 Effect of Elastic Strain; 3.2 Effect of Plastic Strain; 3.2.1 Physical Mechanism; 3.3 Influence of Adsorption and Desorption; 3.4 Summary

4 Modeling the Electronic Work Function4.1 Model of the Elastic Strained Single Crystal; 4.2 Taking into Account the Relaxation and Discontinuity of the Ionic Charge; 4.3 Model for Neutral Orbital Electronegativity; 4.3.1 Concept of the Model; 4.3.2 Effect of Nanodefects Formed on the Surface; 4.4 Summary; 5 Contact Interaction of Metallic Surfaces; 5.1 Mechanical Indentation of the Surface Layers; 5.2 Influence of Indentation and Surface Roughness on the Work Function; 5.3 Effect of Friction and Wear on Energetic Relief; 5.4 Summary; 6 Prediction of Fatigue Location6.1 Forecast Possibilities of the Work Function. Experimental Results6.1.1 Aluminum and Titanium-Based Alloys; 6.1.2 Superalloys; 6.2 Dislocation Density in Fatigue-Tested Metals; 6.3 Summary; 7 Computer Simulation of Parameter Evolutions during Fatigue; 7.1 Parameters of the Physical Model; 7.2 Equations; 7.2.1 Threshold Stress and Dislocation Density; 7.2.2 Dislocation Velocity; 7.2.3 Density of Surface Steps; 7.2.4 Change in the Electronic Work Function; 7.3 System of Differential Equations; 7.4 Results of the Simulation: Changes in the Parameters; 7.5 Summary8 Stressed Surfaces in the Gas-Turbine Engine Components8.1 Residual Stresses in the Surface of Blades and Disks and Fatigue Strength; 8.1.1 Turbine and Compressor Blades; 8.1.2 Grooves of Disks; 8.2 Compressor Blades of Titanium-Based Alloys; 8.2.1 Residual Stresses and Subgrain Size; 8.2.2 Effect of Surface Treatment on Fatigue Life; 8.2.3 Distribution of Chemical Elements; 8.3 Summary; 9 Nanostructuring and Strengthening of Metallic Surfaces. Fatigue Behavior; 9.1 Surface Profile and Distribution of Residual Stresses with Depth; 9.2 Fatigue Strength of the Strained Metallic Surface9.3 Relaxation of the Residual Stresses under Cyclic Loading

Sommario/riassunto

Providing students as well as engineers and researchers with a must-have insight into the complexities of surface structure and behavior, this monograph extends beyond the usual introductory books, presenting concentrated knowledge on the surface science of metals, and connecting fundamentals with actual applications. Beginning with explanations of the intricacies of surfaces and their differences to bulk, it takes the reader through the vital steps towards macroscopic metallic components as well as surface nanostructuring. In so doing, it makes use of theory, experimental techniques, examples

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