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Sommario/riassunto

This book is the second edition of the one originally published in 2016, as the first comprehensive treatment on the fundamentals of hydrogen embrittlement of metallic materials, mainly steel. The book provides students and researchers engaging in hydrogen problems with a unified view of the subject. Establishing reliable principles for materials design against hydrogen embrittlement and assessing their performance are recent urgent industrial needs in developing high-strength steel for hydrogen energy equipment and weight-reducing vehicles. The interdisciplinary nature of the subject, covering metal physics, materials science, and mechanics of fracture, has disturbed a profound understanding of the problem. In this book, previous studies are critically reviewed, and supplemental descriptions of fundamental ideas are presented when necessary. Emphasis is placed on experimental facts, with particular attention to their implication rather than phenomenological appearance. The adopted experimental conditions are also noted since the operating mechanism of hydrogen might differ by material and environment. For theories, employed assumptions and premises are noted to examine their versatility. Progress in the past decade in experimental and theoretical tools is remarkable and has nearly unveiled characteristic features of hydrogen embrittlement. Proposed models have almost covered feasible aspects of the function of hydrogen. This second edition has enriched the contents with recent crucial findings. Chapters on the manifestation of embrittlement in the deterioration of mechanical properties and microscopic features are reorganized, and the description is revised for the convenience of readers' systematic understanding. A new chapter is created for delayed fracture in atmospheric environments as a conclusive subject of critical ideas presented in this book.