Yuqing Weng
Editor

Ultra-Fine Grained Steels

Metallurgical Industry Press

Springer

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With 482 figures

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Preface

This book is composed of ten chapters. Based on systematic description of research achievements of the project of ultra-fine grain steels and their engineering applications, new theories of microstructural refinement and the newly developed technologies in production of high strength and high toughness steels are introduced. The book features the integration of materials science with engineering technology. In the scope of theories of the strengthening and toughening of ultra-fine grain steels, the theory of deformation induced ferrite transformation (DIFT) for ferrite-pearlite steels has been put forward. The phenomenon of ultra-fine grain refinement effect by the existing precipitates of nanometer size in the steel produced by using thin slab casting and rolling (TSCR) has been discovered and analyzed. The theory of deformation induced precipitation and medium temperature phase transformation control for bainitic steels has been proposed. The theory of resistance against delayed fracturing of high strength and high toughness alloy structural steels has been established.

In the aspect of production technologies, some production technologies for obtaining ultra-fine grains and high strength high toughness of steels are introduced. The chemical metallurgy, solidification technique, and welding technique etc. for ultra-fine grain steels are introduced. In the aspect of engineering applications of ultra-fine grain high strength and high toughness steels, all the trial applications and commercial applications in the areas of civil constructions, automobile manufacturing and engineering machinery etc. are described.

The book provides theoretical concepts and engineering application technologies for the research, production, and application of ultra-fine grain steels. It is a good reference for researchers, scientists, engineers, university teachers, students and postgraduates in the fields of steel structural materials research, metal materials and metallurgical engineering research, university & school teaching, and production & application engineering.

Acknowledgements

This book is a systematic report on theoretical achievements, research on new technology, and applications developed under the Important Fundamental Research Program of New Generation Steel Materials—one of National Important Basic Research Programs in the past ten years in China.

The Program has been financially supported by the Ministry of Science and Technology of China. The main steel corporations in China provided great help including laboratory test apparatus and expertise, and in production trials. It has been technically supported by the famous academies and universities in China undertaking technically research and development of steel structural materials, including China Iron and Steel Research Institute Group, Institute of Metal Research of Chinese Academy of Sciences, University of Science and Technology Beijing, Northeastern University and Tsinghua University.

I would like to acknowledge the renowned scholars of steel materials of China, namely, professor Changxu Shi, professor Jun Ke, professor Hengde Li as well as the renowned scholars of metallurgy in China, namely, professor Ruiyu Yin, professor Tieyong Zuo and so on, who have paid their attention to and directed this work. In addition, this work was given sufficient attention to and supported by many individuals of Chinese Academy of Engineering and Ministry of Science and Technology of China, etc. I would like to express my gratitude to them.

Some 400 researchers from more than 20 companies have contributed to the contents of this book with their ideas and conceptions for the past ten years. Without the work that they had done, this book would not have been accomplished.

Ultra fine grain steel is a topic with both traditional and modern significance. We hope some work we have done is useful for the future work of colleagues in materials field. Finally, we wish further success in R&D of ultra-fine grained steels in the future!

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2008-5

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