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Nota di contenuto	Intro -- Fundamental Design of Steelmaking Refractories -- Contents -- Preface -- Acknowledgment -- About Author -- 1 Heat and Mass Transfer -- 1.1 Introduction -- 1.2 Energy Conservation -- 1.3 Conduction -- 1.3.1 Basic Concept and Properties -- 1.3.2 One-Dimensional Steady-state Conduction -- 1.3.3 Two-Dimensional Steady-state Conduction -- 1.4 Convection -- 1.4.1 Boundary Layers -- 1.4.2 Laminar and Turbulent Flow -- 1.4.3 Free and Forced Convection -- 1.4.4 Flow in Confined Region -- 1.5 Radiation -- 1.5.1 Basic Concepts -- 1.5.2 Emission from Real Surfaces -- 1.5.3 Absorption, Reflection, and Transmission by Real Surfaces -- 1.5.4 Exchange Radiation -- 1.6 Mass Transfer -- 1.6.1 Convection Mass Transfer -- 1.6.2 Multiphase Mass Transfer -- 1.6.3 Analogy-Heat, Mass, and Momentum Transfer -- 1.7 Heat Transfer in Refractory Lining -- 1.7.1 Tunnel Kiln -- 1.7.2 Ladle Lining -- References -- 2 Equilibrium and Nonequilibrium Phases -- 2.1 Introduction -- 2.2 Basics of Phase Diagram -- 2.2.1 Gibb's Phase Rule -- 2.2.2 Binary Phase Diagram and Crystallization -- 2.2.3 Ternary Phase Diagram and Crystallization -- 2.2.4 Alkemade Lines -- 2.3 One-Component Phase Diagrams -- 2.3.1 Water -- 2.3.2 Quartz -- 2.4 Two-Component Phase Diagrams -- 2.4.1 Fe-C -- 2.4.2 Two Oxides Phase Diagrams -- 2.5 Three-Component Phase Diagrams -- 2.5.1 Three Oxides Phase Diagrams -- 2.5.2 FeO-SiO2-C -- 2.6 Nucleation and Crystal Growth

Sommario/riassunto

"The first part of the book accentuates the valuable basics of 'Heat and Mass Transfer', 'Equilibrium and Non-equilibrium phases', 'Packing and Stress in Compaction', 'Degree of Ceramic Bonding', 'Thermal and Mechanical Behavior', and 'High Temperature Corrosion' including relevant finite element analysis in the perception of composition design, manufacturing, and failure mechanism of steelmaking

refractories. While considering the steelmaking refractories, a detailed 'Refractories for Primary Steel Making', 'Refractories for Secondary Steel Making', 'Refractories for Precast and Purging System', 'Refractories for Flow Control', 'Refractories for Continuous Casting', and 'Premature Refractory Life by Other Parameters', are essential to acme. These issues have been discussed in the second half of the book to fulfill the academic demand of undergraduate, postgraduate, and research scholars of ceramic engineering, metallurgical engineering, and mechanical engineering outlets who want to nurture in the refractory and steel sectors. The description of such cumulative basic knowledge, collective shop floor data, and relevant failure analysis criteria makes sense and eventually stimulates the awareness of how to grasp and analyze a particular class of refractory for steelmaking. Refractory production, as fighting fit as their consumption, includes a certain degree of heat and mass transfer. Preliminary from the thermodynamics, heat and mass transfer mechanisms are being described, and eventually, an analogy is drawn in Chapter 1. In-situ phase formation during manufacturing and transformation in the presence of impurities are common phenomena in refractory, and thus fundamentals of binary and ternary equilibrium phases and non-equilibrium phases are described in Chapter 2. Optimum compaction and load are a prerequisite to press organic-bonded refractories. A low load regime results in low green density, whether high load beyond critical stress consequences spring back and expedite lamination that eventually produces defect and early stage failure during the maneuver. Such phenomena are deliberated in Chapter 3. Industrial-scale production demands a uniform temperature distribution throughout the kiln to form adequate ceramic bonding or sintering of compact mass otherwise results in premature refractory failure. In this regard, Chapter 4 describes the initial and final stages of sintering, densification, grain growth, and their shape in the matrix. Even with refractory processing failure, meticulous thermal and mechanical stress cracking, severe wear aggravated by abrasion, and corrosion are unavoidable in refractory practice and applications. In these concerns, Chapter 5 highlights the thermal and mechanical behavior, and Chapter 6 underscores the high temperature corrosion mechanism with a relevant model"--