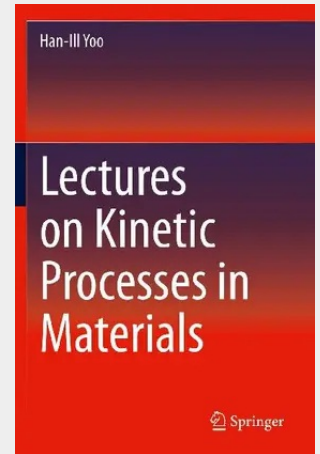


Lectures on Kinetic Processes in Materials

This book provides beginning graduate or senior-level undergraduate students in materials disciplines with a primer of the fundamental and quantitative ideas on kinetic processes in solid materials. Kinetics is concerned with the rate of change of the state of existence of a material system under thermodynamic driving forces. Kinetic processes in materials typically involve chemical reactions and solid state diffusion in parallel or in tandem. Thus, mathematics of diffusion in continuum is first dealt with in some depth, followed by the atomic theory of diffusion and a brief review of chemical reaction kinetics. Chemical diffusion in metals and ionic solids, diffusion-controlled kinetics of phase transformations, and kinetics of gas-solid reactions are examined. Through this course of learning, a student will become able to predict quantitatively how fast a kinetic process takes place, to understand the inner workings of the process, and to design the optimal process of material state change.

- Provides students with the tools to predict quantitatively how fast a kinetic process takes place and solve other diffusion related problems;
- Learns fundamental and quantitative ideas on kinetic processes in solid materials;
- Examines chemical diffusion in metals and ionic solids, diffusion-controlled kinetics of phase transformations, and kinetics of gas-solid reactions, among others;
- Contains end-of chapter exercise problems to help reinforce students' grasp of the concepts presented within each chapter.

Diffusion in Continuum.- Atomic Theory of Diffusion.- Chemical Reaction Kinetics.-
Diffusion in Concentration Gradients.- Kinetics of Phase Transformation: Initial Stage.-
Kinetics of Phase Transformation: Later stage.- Diffusion in Ionic Solids.- Kinetics of
Gas/Solid Reaction: Diffusion-controlled case.



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