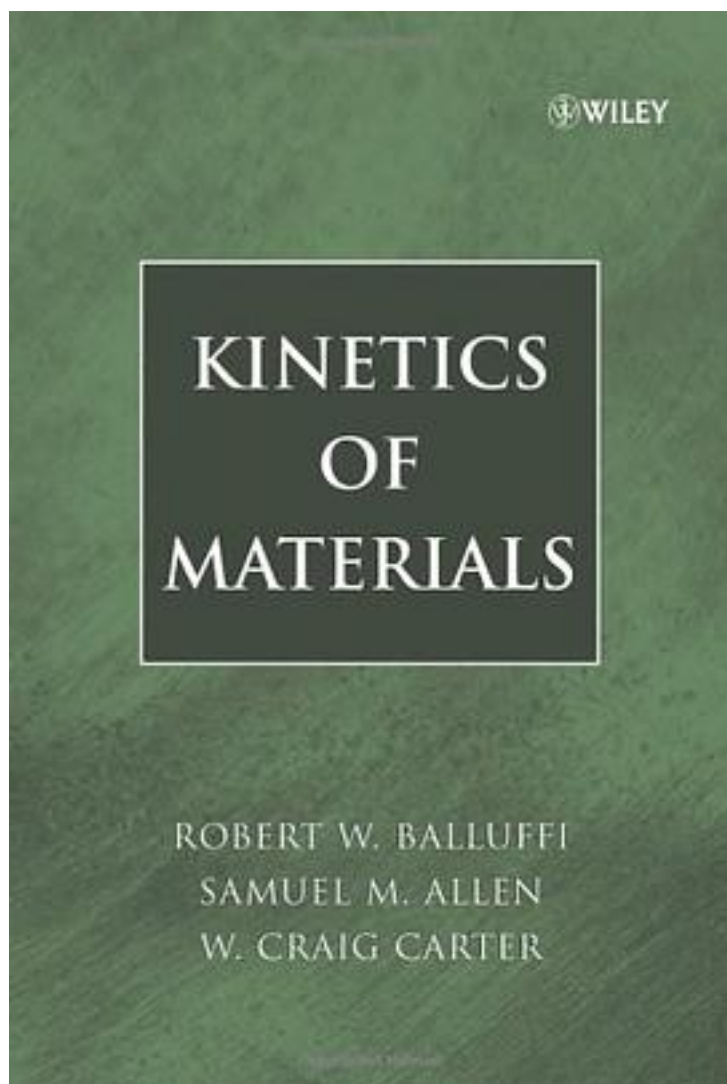


# Kinetics of Materials



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This is a classroom tested textbook providing a fundamental understanding of basic kinetic processes in materials. This textbook, reflecting the hands on teaching experience of its three authors, evolved from Massachusetts Institute of Technology's first year graduate curriculum in the Department of Materials Science and Engineering. It discusses key topics collectively representing the basic kinetic processes that cause changes in the size, shape, composition, and atomistic structure of materials. Readers gain a deeper understanding of these kinetic processes and of the properties and applications of materials. Topics are introduced in a logical order, enabling students to develop a solid foundation before advancing to more sophisticated topics. "Kinetics of Materials" begins with diffusion, offering a description of the elementary manner in which atoms and molecules move around in solids and liquids. Next, the more complex motion of dislocations and interfaces is addressed. Finally, still more complex kinetic phenomena, such as morphological evolution and phase transformations, are treated. Throughout the textbook, readers are instilled with an appreciation of the subject's analytic foundations and, in many cases, the approximations commonly used in the field. The authors offer many extensive derivations of important results to help illuminate their origins. While the principal focus is on kinetic phenomena in crystalline materials, select phenomena in noncrystalline materials are also discussed. In many cases, the principles involved apply to all materials. Exercises with accompanying solutions are provided throughout "Kinetics of Materials", enabling readers to put their newfound knowledge into practice. In addition, bibliographies are offered with each chapter, helping readers to investigate specialized topics in greater detail. Several appendices presenting important background material are also included. With its unique range of topics, progressive structure, and extensive exercises, this classroom tested textbook provides an enriching learning experience for first year graduate students.

#### 作者介绍:

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目录: Preface. Bibliography. Acknowledgments. Notation Table. Symbol Table–Roman. Symbol Table–Greek. 1. Introduction. PART I: MOTION OF ATOMS AND MOLECULES BY DIFFUSION. 2. Irreversible Thermodynamics: Coupled Forces and Fluxes. 3. Driving Forces and Fluxes for Diffusion. 4. The Diffusion Equation. 5. Solutions to the Diffusion Equation. 6. Diffusion In Multi-Component Systems. 7. Atomic Models for Diffusion. 8. Diffusion in Crystals. 9. Diffusion Along Crystal Imperfections. 10. Diffusion in Noncrystalline Materials. PART II: MOTION OF DISLOCATIONS AND INTERFACES. 11. Motion of Dislocations. 12. Motion of Crystalline Surfaces. 13. Motion of Crystalline Interfaces. PART III MORPHOLOGICAL EVOLUTION DUE TO CAPILLARY AND APPLIED MECHANICAL FORCES. 14. Surface Evolution due to Capillary Forces. 15. Coarsening due to Capillary Forces. 16. Morphological Evolution, Diffusional Creep, and Sintering. PART IV: PHASE TRANSFORMATIONS. 17. General Features of Phase Transformations. 18. Spinodal and Order-Disorder Transformations. 19. Nucleation. 20. Growth of Phases in Concentration and Thermal Fields. 21. Concurrent Nucleation and Growth. 22. Solidification. 23. Precipitation. 24. Martensitic Transformations. Appendix A: Densities, Fractions, and Atomic Volumes of Components. Appendix B: Structure of

Crystalline Interfaces. Appendix C: Capillarity and Mathematics of Space Curves and Interfaces. Illustration Credits. Cited Author Index. Figure Index. Topic Index.

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## 评论

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## 书评

MIT教科书，三位MIT大牛的经典作品。内容由浅入深，步步推理都非常严密。而且几乎每章后面还都有习题。  
动力学作为材料学的一个基础课程，这本书是个不错的选择。  
只可惜国内高教的影印版到现在还没出。。。

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