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Nota di contenuto	Chemistry in Motion: Reaction-Diffusion Systems for Micro- and Nanotechnology; Contents; Preface; List of Boxed Examples; 1 Panta Rei: Everything Flows; 1.1 HISTORICAL PERSPECTIVE; 1.2 WHAT LIES AHEAD?; 1.3 HOW NATURE USES RD; 1.3.1 Animate Systems; 1.3.2 Inanimate Systems; 1.4 RD IN SCIENCE AND TECHNOLOGY; REFERENCES; 2 Basic Ingredients: Diffusion; 2.1 DIFFUSION EQUATION; 2.2 SOLVING DIFFUSION EQUATIONS; 2.2.1 Separation of Variables; 2.2.2 Laplace Transforms; 2.3 THE USE OF SYMMETRY AND SUPERPOSITION; 2.4 CYLINDRICAL AND SPHERICAL COORDINATES; 2.5 ADVANCED TOPICS; REFERENCES 3 Chemical Reactions3.1 REACTIONS AND RATES; 3.2 CHEMICAL EQUILIBRIUM; 3.3 IONIC REACTIONS AND SOLUBILITY PRODUCTS; 3.4 AUTOCATALYSIS, COOPERATIVITY AND FEEDBACK; 3.5 OSCILLATING REACTIONS; 3.6 REACTIONS IN GELS; REFERENCES; 4 Putting It All Together: Reaction-Diffusion Equations and the Methods of Solving Them; 4.1 GENERAL FORM OF REACTION-DIFFUSION EQUATIONS; 4.2 RD EQUATIONS THAT CAN BE SOLVED ANALYTICALLY; 4.3 SPATIAL

DISCRETIZATION; 4.3.1 Finite Difference Methods; 4.3.2 Finite Element Methods; 4.4 TEMPORAL DISCRETIZATION AND INTEGRATION; 4.4.1 Case 1: tRxn > tDiff
4.4.1.1 Forward time centered space (FTCS) differencing4.4.1.2 Backward time centered space (BTCS) differencing; 4.4.1.3 Crank-Nicholson method; 4.4.1.4 Alternating direction implicit method in two and three dimensions; 4.4.2 Case 2: tRxn << tDiff; 4.4.2.1 Operator splitting method; 4.4.2.2 Method of lines; 4.4.3 Dealing with Precipitation Reactions; 4.5 HEURISTIC RULES FOR SELECTING A NUMERICAL METHOD; 4.6 MESOSCOPIC MODELS; REFERENCES; 5 Spatial Control of Reaction-Diffusion at Small Scales: Wet Stamping (WETS); 5.1 CHOICE OF GELS; 5.2 FABRICATION
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8 Reaction-Diffusion at Interfaces: Structuring Solid Materials

Sommario/riassunto

Change and motion define and constantly reshape the world around us, on scales from the molecular to the global. In particular, the subtle interplay between chemical reactions and molecular transport gives rise to an astounding richness of natural phenomena, and often manifests itself in the emergence of intricate spatial or temporal patterns. The underlying theme of this book is that by "setting chemistry in motion" in a proper way, it is not only possible to discover a variety of new phenomena, in which chemical reactions are coupled with diffusion, but also to build micro-/nanoarchitectures

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