1. Record Nr. UNINA9910779008803321

Titolo	Evaporative self-assembly of ordered complex structures [[electronic resource] /] / editor, Zhiqun Lin
Pubbl/distr/stampa	Singapore, : World Scientific Pub. Co., 2012
ISBN	1-280-66919-5 9786613646125 981-4304-69-7
Descrizione fisica	1 online resource (395 p.)
Altri autori (Persone)	LinZhiqun
Disciplina	547.2
Soggetti	Solubility Polymers Colloids DNA
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	CONTENTS; Preface; 1. Drying a Sessile Droplet: Imaging and Analysis of Transport and Deposition Patterns; 1.1. Introduction; 1.2. The Basic Droplet-Drying Phenomenon; 1.3. Mathematic Models; 1.3.1. Droplet shape; 1.3.2. Governing equations; 1.3.3. Boundary conditions; 1.3.3.1. Mass transfer in the vapor phase; 1.3.3.2. Heat transfer in droplet and substrate; 1.3.3.3. Momentum transfer; 1.4. Vapor Phase Transport; 1.4.1. Analytical solutions; 1.4.2. Finite element analysis; 1.5. Height-Averaged Radial Velocity; 1.6. Full Flow Solution without Marangoni Effect 1.6.1. The derivation of the flow field1.6.2. Finite element analysis; 1.6.3. Comparison between finite element and analytical solutions; 1.6.4. Application to deposition and stretching of DNA; 1.7. Full Flow Solutions with Marangoni Effect; 1.7.1. Expressions for the velocity field with a thermal Marangoni stress boundary condition; 1.7.2. General expressions for the velocity field with Marangoni stresses; 1.7.3. Full analytical solutions; 1.7.4. Temperature field; 1.7.5. Velocity field; 1.7.6. Surface-active contaminants; 1.7.7. Marangoni stress reverses particle deposition pattern

1.8. Manipulation of Flow for Patterned Depositions1.9. Conclusions and Outlook; References; 2. Convective Assembly of Patterned Media; 2.1. Introduction; 2.2. Review of Prevailing Mechanisms in Convective Assembly; 2.2.1. Drop casting of colloidal suspensions; 2.2.2. Deposition of colloidal particles in plate-withdrawal experiments or vertical deposition; 2.3. Spontaneously Patterned Colloidal Structures; 2.3.1. Patterning by exploiting the Marangoni-Benard instability; 2.3.2. Patterning by fingering instabilities or unstable fluid fronts; 2.3.3. Patterning by the capillary instability
2.3.4. Patterning by contact line pinning and jumping2.3.5. Patterning by spontaneous dewetting; 2.4. Templating of Colloidal Structures Using Patterned Substrates; 2.4.1. Particle patterning exploiting surfaces of patterned surface charge; 2.4.2. Particle patterning exploiting surfaces of patterned wetting; 2.4.3. Particle patterning exploiting surfaces of patterned topography; 2.4.3.1. Capillarity based assembly in surfaces of patterned topography; 2.4.3.2. Ordering in the presence of applied fields; 2.4.3.3. The use of confinement and capillary interactions to form ordered structures
2.5. Open Issues2.6. Conclusions and Outlook; References; 3. Materials Deposition in Evaporating Menisci - Fundamentals and Engineering Applications of the Convective Assembly Process; 3.1. Introduction and Background to Convective Assembly; 3.1.1. Convective assembly in thin wetting films; 3.1.2. Drying droplets - The dynamics of deposition and structure of the deposits; 3.2. Engineering of the Process of Convective Assembly at High Volume Fractions; 3.2.1. The effect of evaporation rate and particle concentration; 3.2.2. The effect of temperature
3.2.3. The effect of electrolytes and surfactants

Sommario/riassunto

The use of spontaneous self-assembly, as a lithographic tool and as an external field-free means to construct well-ordered and intriguing patterns, has received much attention due to its ease of producing complex, large-scale structures with small feature sizes. An extremely simple route to highly-ordered, complex structures is the evaporative self-assembly of nonvolatile solutes (e.g., polymers, nanoparticles, carbon nanotubes, and DNA) from a sessile droplet on a solid substrate. To date, a few studies have elegantly demonstrated that self-organized nanoscale, microscale, and hierarchically