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Self-Assembly and Nanotechnology

A Force Balance Approach

Yoon S. Lee

SELF-ASSEMBLY AND NANOTECHNOLOGY

A Force Balance Approach

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To my mother

PREFACE AND ACKNOWLEDGMENTS

The area of nanotechnology has grown tremendously over the past decade and is expected to keep growing rapidly in the future. In following this new megatrend, there is a strong sense of need for education in nanotechnology among the academic community. However, nanotechnology is a huge topic that cannot be covered by a single book. This book covers the topic of self-assembly and its implications for nanotechnology. Self-assembly is now widely identified as one of the major themes in the development of nanotechnology. The two-part scheme of this book properly addresses this fact: Part I is on self-assembly and Part II is on nanotechnology.

I designed this book to be a concept book. My experience is that too many details often hinder underlying principles and logics. Comprehensive delivery of the right concepts is the first step toward successful teaching, especially for a complex subject like nanotechnology. I came up with clear schematic illustrations for almost every section to properly represent the mainstream principles behind each topic. Care has been taken to avoid having the book become an exhausting review, with selective use of specific data. However, those who desire more advanced study will find thorough citations at the end of each chapter.

The book is primarily designed for both undergraduates and graduates who have at least mid-level background in chemistry or chemistry-related fields. Those who have taken basic organic, physical, and/or inorganic chemistry courses should have little difficulty following the streamlined topics of this book. This feature will make this book a good tool when the course objective is to bridge the topics of self-assembly, colloids, and surfaces with nanotechnology. It can also be used as a part of the teaching materials when the courses are joint-efforts across different disciplines or different departments that intend to cover a broader range of nanotechnology. Joint-courses have become increasingly popular these days; in fact, this is an especially effective teaching scheme for nanotechnology.

At the same time, this book is intended for academic/industrial professionals, too. Its whole scope is networked around one stem concept: *force balance*. This is to show that a good deal of the related topics in self-assembly and nanotechnology can be approached with one unified concept, once we expand our view on self-assembly. This feature could provide some useful insights into the research of professionals, especially when they try to understand the seemingly complex self-assembly phenomena behind the nanotechnology issues. Considering the inter- and multidisciplinary natures of nanotechnology, this book should

be friendly reading not just for chemistry majors, but for those in chemical engineering, physics, and materials science as well.

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PART I

SELF-ASSEMBLY