



Growth and Transport in Nanostructured Materials: Reactive Transport in PVD, CVD, and ALD (SpringerBriefs in Materials)

Angel Yanguas-Gil

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This book will address the application of gas phase thin film methods, including techniques such as evaporation, sputtering, CVD, and ALD to the synthesis of materials on nanostructured and high aspect-ratio high surface area materials. We have chosen to introduce these topics and the different application fields from a chronological perspective: we start with the early concepts of step coverage and later conformality in semiconductor manufacturing, and how later on the range of application branched out to include others such as energy storage, catalysis, and more broadly nanomaterials synthesis.

The book will describe the ballistic and continuum descriptions of gas transport on nanostructured materials and then will move on to incorporate the impact of precursor-surface interaction. We will finally conclude approaching the subjects of feature shape evolution and the connection between nano and reactor scales and will briefly present different advanced algorithms that can be used to effectively compute particle transport, in some cases borrowing from other disciplines such as radiative heat transfer. The book gathers in a single place information scattered over thirty years of scientific research, including the most recent results in the field of Atomic Layer Deposition. Besides a mathematical description of the fundamentals of thin film growth in nanostructured materials, it includes analytic expressions and plots that can be used to predict the growth using gas phase synthesis methods in a number of ideal approximations. The focus on the fundamental aspects over particular processes will broaden the appeal and the shelf lifetime of this book. The reader of this book will gain a thorough understanding on the coating of high surface area and nanostructured materials using gas phase thin film deposition methods, including the limitations of each technique. Those coming from the theoretical side will gain the knowledge required to model the growth process, while those readers more interested in the process development will gain the theoretical understanding will be useful for process optimization.

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