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Nota di contenuto	Preface -- 1 Multi-scale modeling and simulation of polymer flow -- 1.1 Introduction -- 1.2 Macroscopic modeling and simulations -- 1.3 Multi-scale kinetic theory of viscoelastic flow -- 1.4 Micro-macro simulations using the stochastic approach -- 1.5 Micro-macro simulations using the Fokker-Planck approach -- 1.6 The impact of closure approximations -- 1.7 Illustrative examples of complex flow simulations -- 1.8 Discussion -- 1.9 Conclusions -- References -- 2 Complex flows of micro/nano structured fluids: Reinforced polymer composites -- 2.1 Introduction -- 2.2 Dilute and semi-dilute suspensions -- 2.3 Processing flow simulation -- 2.4 Concentrated suspensions involving rod clusters -- 2.5 Advanced topics -- References -- 3 Flows of simple fluids in complex microstructures -- 3.1 Introduction -- 3.2 Description of fibrous microstructures in composites -- 3.3 Governing equations for flows in porous media --

3.4 Flow of simple fluids in non-deformable fibrous microstructures -- 3.5 Flow of complex fluids in non-deformable fibrous microstructures -- 3.6 Numerical simulation -- References.

Sommario/riassunto

This book gives a detailed and practical introduction to complex flows of polymers and reinforced polymers as well as the flow of simple fluids in complex microstructures. Over the last decades, an increasing number of functional and structural parts, made so far with metals, has been progressively reengineered by replacing metallic materials by polymers, reinforced polymers and composites. The motivation for this substitution may be the weight reduction, the simpler, cheaper or faster forming process, or the ability to exploit additional functionalities. The present Brief surveys modern developments related to the multi-scale modeling and simulation of polymers, reinforced polymers, that involve a flowing microstructure and continuous fiber-reinforced composites, wherein the fluid flows inside a nearly stationary multi-scale microstructure. These developments concern both multi-scale modeling, defining bridges between the micro and macro scales - with special emphasis on the mesoscopic scale at which kinetic theory descriptions apply and advanced simulation techniques able to address efficiently the ever more complex and detailed models defined at different scales. This book is addressed to students (Master and doctoral levels), researchers and professionals interested in computational rheology and material forming processes involving polymers, reinforced polymers and composites. It provides a unique coverage of the state of the art in these multi-disciplinary fields.