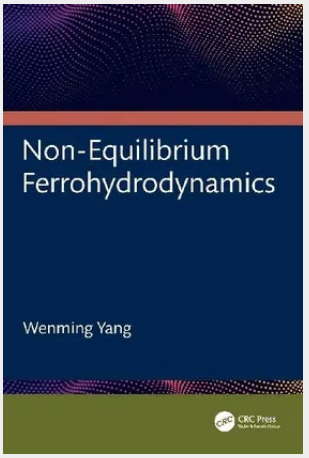
Yang

Non-Equilibrium Ferrohydrodynamics



Ferrofluids, a synthetic intelligent liquid material, exhibit fascinating flow phenomena when subjected to magnetic fields. This book systematically examines the fundamentals, applications, mathematical derivations, and properties of non-equilibrium ferrohydrodynamics and explores the magnetization and viscosity properties of ferrofluids. The book begins with an introduction to the basic concepts and applications of non-equilibrium ferrohydrodynamics and transport theory. It then goes on to discuss the equations of non-equilibrium and quasi-equilibrium ferrohydrodynamics and the magnetic levitation force in ferrofluids. The author discusses two crucial properties of ferrofluids: magnetization properties and viscosity properties, presenting the ferrofluid magnetization equations and the magnetoviscous effect, an important physical manifestation of non-equilibrium theory. Different types of flows of ferrofluids under the application of different magnetic field configurations are also elucidated, illustrating specific manifestations of non-equilibrium ferrohydrodynamics in different flow patterns. This book will be a valuable reference for researchers and students of mechanical engineering with an interest in fluid dynamics, computational mechanics, and electromagnetism. Professionals working in areas of ferrofluid applications such as mechanics, petrochemical engineering, environmental sciences, and biomedicine will also benefit.

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165,60 €
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Lieferfrist: bis zu 10 Tage

Artikelnummer: 9781032889061
Medium: Buch
ISBN: 978-1-032-88906-1
Verlag: CRC Press
Erscheinungstermin: 23.12.2024
Sprache(n): Englisch
Auflage: 1. Auflage 2024
Produktform: Gebunden
Gewicht: 796 g
Seiten: 317
Format (B x H): 183 x 260 mm

Kundenservice Verlag Dr. Otto Schmidt KG
Neumannstraße 10, 40235 Düsseldorf | kundenservice@otto-schmidt.de | 0221-93738-997 (Inland)