1. Record Nr. UNINA9911006994603321

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Titolo	Ferrohydrodynamics
Pubbl/distr/stampa	Newburyport, : Dover Publications, 2013
ISBN	9781523106738 1523106735 9780486783000 0486783006
Descrizione fisica	1 online resource (612 p.)
Collana	Dover Books on Physics
Disciplina	538/.44
Soggetti	Magnetic fluids
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di contenuto	Cover; Title page; Copyright page; Dedication; Contents; Preface; 1 Introduction; 1.1 Scope of ferrohydrodynamics; 1.2 Ferromagnetic solids; 1.3 Magnetic fluids; 1.4 Ferromagnetic concepts and units; Definition of the field; External field of a dipole source; Magnetic force and torque on dipolar matter; Interaction energy of two dipoles; 1.5 Concepts of fluid mechanics; Continuity equation; Substantial derivative; 1.6 Generalized Bernoulli equation; 1.7 Stress tensor and its physical meaning; Force resulting from a stress tensor; Addendum: equivalence of dipolar and polar representations Comments and supplemental references2 Magnetic fluids; 2.1 Stability requirements; Stability in a magnetic-field gradient; Stability against settling in a gravitational field; Stability against magnetic agglomeration; Necessity to guard against the van der Waals attractive force; 2.2 Preparation of magnetic colloids by size reduction; 2.3 Preparation of ferrofluids by chemical precipitation; Magnetite precipitation with steric stabilization; Cobalt particles in an organic carrier; Charge-stabilized magnetite; 2.4 Other magnetic fluids; Paramagnetic salt solutions; Metallic-base ferrofluid 2.5 Surface adsorption and steric stabilizationSteric repulsion mechanism; Net interaction curve; Dispersant structural guidelines; 2.6 Ferrofluid modification; Phenomenological basis; Carrier liquid

exchange; Surfactant exchange; 2.7 Physical properties; Equilibrium magnetization: superparamagnetism; Magnetic relaxation; Viscosity; Concentrated suspensions; 2.8 Correlation phenomena; 2.9 Tabulated physical properties; Comments and supplemental references; 3 Electromagnetism and fields; 3.1 Magnetostatic field equations; Scalar potential; 3.2 Magnetic-field boundary conditions
3.3 Maxwell stress tensorPortrait of the Maxwell stress tensor; 3.4 Maxwell's equations; Integral equations; Differential equations; 3.5 Energy density of the electromagnetic field; 3.6 Transformed expression for the field energy; Comments and supplemental references; 4 Stress tensor and the equation of motion; 4.1 Thermodynamic background; 4.2 Formulation of the magnetic stress tensor; Stress tensor of a magnetizable fluid; What is the "pressure" in a magnetized fluid?; 4.3 Magnetic body-force density; Alternative general forms; Alternative reduced forms
Remarks concerning striction in compressible media4.4 Equation of motion for magnetic fluid; Alternative forms of the equation of motion; Comments and supplemental references; 5 The ferrohydrodynamic Bernoulli equation; 5.1 Derivation; 5.2 Boundary conditions; 5.3 Categories of equilibrium inviscid flows; 5.4 Applications of the FHD Bernoulli equation; Classical Quincke problem; Surface elevation in a normal field; Magnetic nozzle; Modified Gouy experiment; Conical meniscus; Origin of the radial force; Magnetic-fluid rotary-shaft seals; 5.5 Earnshaw's theorem and magnetic levitation
Simplified treatment of the levitation of a nonmagnetic body

Sommario/riassunto

The behavior and dynamics of magnetic fluids receive a coherent, comprehensive treatment in this high-level study. One of the best classical introductions to the subject, the text covers most aspects of particle interaction, from magnetic repulsion to quasi-stable equilibriums and ferrohydrodynamic instabilities. Suitable for graduate students and researchers in physics, engineering, and applied mathematics.