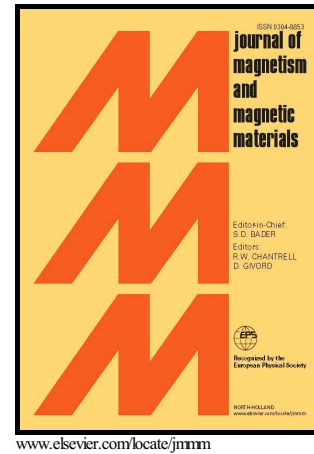


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Measurement of Magnetic Moment via Optical Transmission

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Abstract

The magnetic moment of nanoparticles is an important property for drug targeting and related applications as well as for the simulation thereof. However, the measurement of the magnetic moment of nanoparticles, nanoparticle-virus-complexes or microspheres in solution can be difficult and often yields unsatisfying or incomparable results.

To measure the magnetic moment, we designed a custom measurement device including a magnetic set-up to observe nanoparticles indirectly via light transmission in solution. We present a simple, cheap device of manageable size, which can be used in any laboratory as well as a novel evaluation method to determine the magnetic moment of nanoparticles via the change of the optical density of the particle suspension in a well-defined magnetic gradient field.

In contrast to many of the established measurement methods, we are able to observe and measure the nanoparticle complexes in their natural state in the respective medium. The nanoparticles move along the magnetic gradient and thereby away from the observation point. Due to this movement, the optical density of the fluid decreases and the transmission increases over time at the measurement location. By comparing the measurement with parametric simulations, we can deduce the magnetic moment from the observed behavior.

Keywords: Magnetic moment, Magnetic nanoparticles, Magnetophoretic mobility, Optical density

1. Introduction

Magnetic Nanoparticles (MNPs) are characterized by several different physical properties like zeta potential, magnetic moment, hydrodynamic and core diameter as well as several additional properties, e.g. the composition of coating and core. The magnetic moment, μ , or the magnetization, M , of the MNPs is a non-biological property and a crucial input parameter for many simulations. The magnetization describes the strength of the magnetic dipole moment of the MNP at a certain magnetic field strength and is defined as magnetic moment

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