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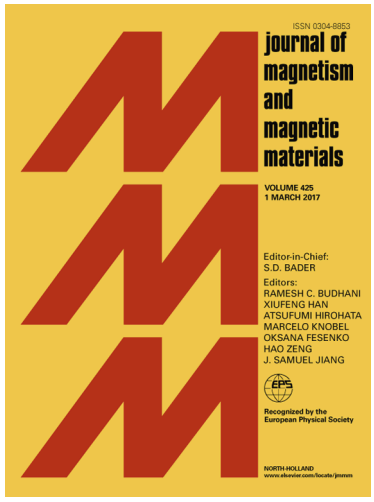

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Magnetic properties of "doped" DNA

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Abstract

A series of double-stranded DNA samples, containing cholesteric liquid crystal droplets, were investigated. Binding of DNA molecules with Gd^{3+}, La^{3+}, Cu^{2+}, ions was carried out. The samples were characterized by X-ray, optical circular dichroism and EPR techniques. Magnetic SQUID magnetometer research showed significant deviations of Gd^{3+} paramagnetism from the Curie-Weiss law. A possibility of spin-glass-like interactions was analyzed. The dispersion of magnetic parameters was claimed as a main reason of magnetic anomalies observed in the liquid crystal DNA-metal systems. Such systems can be useful in biomedical applications as low-toxic magnetic labels.
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Keywords: magnetic properties; EPR, DNA, rare earths, gadolinium, copper, nanoconstructions

1. Introduction

Deoxyribonucleic acid (DNA) is the carrier of genetic information in living systems [1]. Magnetic properties of pristine DNA and DNA-metal complexes have been intensively investigated both in biological and non-biological contexts [2-12]. The former is related to DNA replication, transcription of genetic codes, DNA-protein mediation, toxicity of heavy metal ions and other phenomena depending partly on metal binding to specific DNA sites [1, 2]. In the latter context, DNA is treated from the viewpoint of materials science [3, 8]. For example, in modern bottom-up nanotechnology, DNA has become an important building block. The one of promising nanotechnology approaches is hierarchical self-assembling of discrete functional molecular entities into complex nanostructures. DNA has superior properties for self-assembly [3, 8], optimized through billions of years of evolution. Indeed, DNA is a polymeric macromolecule which is usually packed very densely in the cell [1]. Native DNA condensed forms can resemble artificial poly-

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