

Supercomputer Simulation of Magnetic Multilayers Films

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Abstract : The necessity of studying magnetic multilayer structures is explained by the prospects of their practical application as a technological base for creating new storages medium. Magnetic multilayer films have many unique features that contribute to increasing the density of information recording and the speed of storage devices. Multilayer structures are structures of alternating magnetic and nonmagnetic layers. In frame of the classical Heisenberg model, lattice spin systems with direct short- and long-range exchange interactions were investigated by Monte Carlo methods. The thermodynamic characteristics of multilayer structures, such as the temperature behavior of magnetization, energy, and heat capacity, were investigated. The processes of magnetization reversal of multilayer structures in external magnetic fields were investigated. The developed software is based on the new, promising programming language Rust. Rust is a new experimental programming language developed by Mozilla. The language is positioned as an alternative to C and C++. For the Monte Carlo simulation, the Metropolis algorithm and its parallel implementation using MPI and the Wang-Landau algorithm were used. We are planning to study of magnetic multilayer films with asymmetric Dzyaloshinskii-Moriya (DM) interaction, interfacing effects and skyrmions textures. This work was supported by the state task of the Ministry of Education and Science of the Russia # 3.7383.2017/8.9

Keywords : The Monte Carlo methods, Heisenberg model, multilayer structures, magnetic skyrmion

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