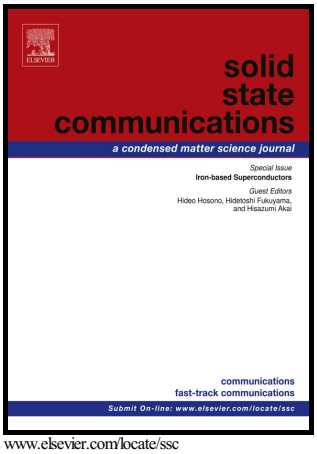

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Quantum Monte Carlo study of the electric properties of a ferroelectric superlattice

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Abstract

By using quantum Monte Carlo (MC) simulation, the electric properties of an Ising spin superlattice formed by two ferroelectric slabs A and B with an antiferroelectric interfacial coupling was studied within the framework of the Transverse Ising Model (TIM). We have examined the effects of the temperature T and the transverse field Ω on the polarization properties. We have also examined the effects of the interfacial coupling J_{AB}, T, and Ω on the hysteresis behavior. Our results are in good agreement with the previous theoretical results; we have found that the critical temperature T_c and the critical transverse field Ω_c decrease with the increase of Ω and T respectively. In addition one or triple hysteresis loops can appear in the present system.

Keywords: Transverse Ising model; Quantum phase transition; Quantum Monte Carlo simulation; Ferroelectric; Superlattice

1. Introduction

With the rapid development of advanced synthetic techniques, much attention has been devoted to the study of ferroelectric superlattices since a wide array of fascinating properties due to their potential applications such as manufacture of electronics, magnetic storage devices, medical applications [**1-6**]. The study of the electric properties of superlattices composed of two or

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