Size dependent effects in ordered ultrathin ferroic films

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Abstract

Ultrathin ferroic (magnetic or ferroelectric) films (UFF) as quasi-2D system now are widely applied as important materials for modern electronic devices. In this research, size dependence of the order parameters (magnetization or polarization) phase transition temperature, specific heat of UFF is investigated theoretically using Ising model in transversal and longitudinal fields. Calculation within mean field and correction from Gaussian fluctuation theory shows enhancement of the size dependence effects due to fluctuation of the order parameter. Density functional theory calculation for some ferroelectric titanate perovskite ultrathin films is also carried out for comparison with analytical and experimental results.

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