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Thermodynamic and electrical properties of ferroelectric domains in films IGOR LUK'YANCHUK, LAURENT LAHOCHE, FRANCOIS DE GUERVILLE, University of Picardy — The energetically unfavorable depolarization field produced in ferroelectric materials by the surface bound charges is screened in the macroscopic samples by either intrinsic or electrode charge carries. In the micro- and nanoscale case, however, formation of periodic polarization domains seems to be more efficient mechanism of the reducing of the depolarization field that makes the physics of these devices different to the bulk samples. We present the results of modeling of ferroelectric domains and domain textures in ferroelectric thin films and periodic paraelectric/ferroelectric superlattices, basing on the self-consistent solution of the coupled electrostatic and Ginzburg-Landau equations. Our principal result is that, two different types of domain structure occur in micro- and nanoscopic samples. (a) Soft domains with gradual sinus-like polarization profile can exist in the large temperature interval below transition temperature Tc in thin nanometric films. (b) Hard domains with flat Kittel-like polarization profile and narrow domain walls are realized at low temperatures and in thick ferroelectric films. We calculate the temperature dependence of the dielectric susceptibility for the both types of domains and compare results wit experiment.

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