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Interlayer Coupling and Dielectric Anomaly in Ferroelectric Bilayers and Multilayer Heterostructures S. PAMIR ALPAY, SHAN ZHONG, University of Connecticut, ALEXANDER L. ROYTBURD, University of Maryland, JOSEPH V. MANTESE, Delphi Research Laboratories — Ferroelectric multilayers and superlattices have gained interest for dynamic random access memory (DRAM) applications and as active elements in tunable microwave devices in the telecommunications industry. There have been a number of experimental studies that show that these materials have many peculiar properties that cannot be described by a simple series connection of the individual layers that make up the heterostructures. A thermodynamic analysis is presented to demonstrate that ferroelectric multilayers interact through internal elastic, electrical, and electromechanical fields and the "strength" of the coupling can be quantitatively described using Landau theory of phase transformations, theory of elasticity, and principles of electrostatics. The thermodynamic modeling indicates that the electrostatic coupling between the layers leads to the suppression of ferroelectricity at a critical paraelectric layer thickness for ferroelectric-paraelectric bilayers. This bilayer is expected to have a gigantic dielectric response similar to the dielectric anomaly near Curie-Weiss temperature in homogeneous ferroelectrics at this critical thickness.

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