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Magnetoelectric Interactions in Ferromagnetic-Piezoelectric Layered Nanostructures V.M. PETROV, G. SRINIVASAN, Oakland University, Rochester, MI, M.I. BICHURIN, Novgorod State University, Russia, D. VIEHLAND, Virginia Tech, VA, CE-WEN NAN, Tsinghua University, China —
A theoretical model is presented for low frequency magnetoelectric (ME) coupling in ferrite-piezoelectric nanobilayers of ferrite and piezoelectrics. The nanocomposite is considered as a homogeneous medium with piezoelectric and magnetostrictive subsystems and we take into account clamping effect of the substrate in determining the ME voltage coefficient. The model could be used to estimate the ME couplings from known material parameters (piezoelectric modules, magnetostriction, stiffness, geometrics). Expressions for ME coefficient are obtained using the solution of the elastostatic and electrostatic equations. The effect of material parameters on the ME susceptibility is studied. Increasing the substrate thickness results in a decrease in the ME interaction due to the clamping caused by the substrate. With increasing substrate thickness the theory also predicts a shift in the volume fraction of PZT that corresponds to peak ME coefficient. The research was supported by grants from the NSF (DMR-0606153; NIRT-0609377; ECCS-0621907).

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