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Dynamical interfacial-electric-field-induced electro-optics in multilayer semiconductors Y.D. GLINKA, J.K. MILLER, N.H. TOLK, Vanderbilt University, X. LIU, Y. SASAKI, J.K. FURDYNA, University of Notre Dame — Multilayer semiconductors with the thickness of layers of a few tens of nanometers are common materials for designing novel multifunctional electronic and optoelectronic devices. Once the materials are subjected to ultrafast laser light, the dynamical interfacial electric fields between adjacent layers is created as a result of charge separation at the interfaces within the carrier thermalization process. This dynamical electric field affects the ultrafast optical properties of the materials additionally to that of the bleaching effect (phase space filling-Pauli blocking). We report the first application of pump-probe technique allowing the interfacial-field-induced both electro-optical refractive-index change and the second harmonic generation to be monitored simultaneously. The pump-probe spectroscopy of GaAs/GaSb/InAs multilayers reveals predominantly the electro-optical nature. The interfacial fields contribute to the variety of electro-optical effects allowing the temporal and spatial resolution in carrier dynamics to be reached by monitoring responses resulted from different order nonlinear polarizations. The absorption bleaching is a secondary effect appearing with much smaller magnitude.

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