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Title:Induced terahertz emission as a probe for semiconductor devices
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Abstract:A nondestructive and contact free method for the characterization of semiconductor devices is presented using stimulated terahertz (THz) emission. For demonstration purposes, nanostructured semiconductor-insulator-semiconductor solar cells are investigated. These solar cells are based on indium tin oxide (ITO) upon black silicon (BS). During illumination with fs laser pulses, free charge carriers are generated at the junction between ITO and BS yielding the emission of broadband THz radiation. Since the THz field strength depends on the acceleration characteristics of the photoinduced charge carriers, phase sensitive detection of the emitted THz signal reflects the existing electric field distribution at the boundary zone. In contrast to existing methods where the sample is illuminated by an additional THz generator, here, the THz emission itself characterizes the sample. Moreover, only the region of THz generation is probed yielding a depth-resolved measurement setup that can be applied for the investigation of semiconductor multilayer systems in general as far as THz generation is supported.
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