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Optical response of semiconductors in a dc-electric field LUCIE PRUSSEL, VALERIE VENIARD, Laboratoire des Solides Irradies, Ecole Polytechnique, CNRS, CEA/DSM and ETSF — A deep understanding of the optical properties of solids is crucial for the improvement of nonlinear materials and devices. It offers the opportunity to search for new materials with specific properties. One way to tune some of those properties is to apply an electrostatic field. This gives rise to electro-optic effects. The most known among those is the Pockel or linear electro-optic effect (LEO), which is a second order response property described by the susceptibility $\chi^{(2)}(-\omega;\omega,0)$. An important nonlinear process is the second harmonic generation (SHG), where two photons are absorbed by the material. While this process is sensitive to the symmetry of the material, adding a static field would enable a nonlinear response from every material, including centrosymmetric ones. This happens through a third order process, named EFISH (Electric Field Induced Second Harmonic) for which the susceptibility of interest is $\chi^{(3)}(-2\omega;\omega,\omega,0)$. We have developed a theoretical approach and a numerical tool to study these two nonlinear properties (LEO and EFISH) in the context of Time-dependent Density Functional Theory (TDDFT), and we have applied it to the case of bulk SiC and GaAs as well as layered systems such as Ge/SiGe.

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