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Bandgap dependence in the multiphoton absorption coefficient of semiconductors[1] DONGMIN SEO, University of Minnesota, JUSTIN GREGORY, Vanderbilt University, LEONARD FELDMAN, The State University of New Jersey, NORMAN TOLK, Vanderbilt University, PHILIP COHEN, University of Minnesota — Reports of two and three photon absorption coefficients in common semiconductors show a remarkably large lack of agreement and lack of scaling, indicating the need for more controlled experiments. We report nonlinear photon absorption in single-crystal Si, GaAs, and Ge carried out under identical conditions using an ultrafast high-power mid-IR laser. Wavelength- and bandgap-dependent multiphoton absorption coefficients were extracted and compared to current literature values, as well as the simpler scaling predictions for different bandgap materials. Our experimental data support the theoretical scaling law for the bandgap-dependent multiphoton absorption coefficients. Importantly, our coefficients are approximately 2 orders of magnitude smaller than current literature values.

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