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Terahertz Perturbed, Mid-infrared Driven High-Order Harmonic Generation from Solids[1] SHA LI, YAGUO TANG, ZHOU WANG, KENT TALBERT, YANG CHENG, FENGYUAN YANG, PIERRE AGOSTINI, LOUIS DIMAURO, The Ohio State University — We have studied high-order harmonic generation from ZnO thin film driven by an 80 fs, 3.6 μm mid-infrared (MIR) pulse, and dressed by a 2 ps, 600 μm single-cycle terahertz (THz) pulse. The existence of the weak quasi-DC THz field breaks the symmetry of the MIR driving field and/or the symmetry of the crystal, and we observe the generation of even-order harmonics, up to harmonic order 20. The intensity of each even-order harmonic scales linearly with that of the THz pulse, indicating a perturbation that involves one THz photon. We also find that, when the THz field is applied, the intensities of the odd-order harmonics are reduced (e.g., harmonic order 19, $I(F\text{THz} = 300\ \text{kV/cm}) \approx 0.65 * I(F\text{THz} = 0)$), while the intensity of the total harmonics (odd + even) stays constant, indicating that the alternation of the generalized electron-hole recollision by the THz field results in a repopulation of the total harmonics into each harmonic order. Our study paves the way for ultrafast control of the high harmonic generation process in solids by THz fields and suggests a novel method for THz metrology.

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