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Photoinduced EPR study of electron traps in TiO_2 crystals: Oxygen vacancies and Ti^{3+} ions SHAN YANG, ADAM BRANT, LARRY HALLIBURTON, Physics Department, West Virginia University — Electron paramagnetic resonance (EPR) provides a sensitive method to monitor native defects in wide-band-gap semiconductors. In-situ illumination with laser light at low temperature (photoinduced EPR) forms paramagnetic defects in fully oxidized bulk TiO_2 crystals. Illumination with 442 nm laser light at 30 K and below produces four electronlike centers and one holelike center. Three of the electronlike centers have S = 1/2 and are assigned, respectively, to a substitutional Ti^{3+} ion in the otherwise perfect lattice, a substitutional Ti^{3+} ion adjacent to a Si^{4+} ion, and a substitutional Ti^{3+} ion adjacent to an oxygen vacancy. The fourth electronlike center has S = 1 and is assigned to two Ti^{3+} ions adjacent to one oxygen vacancy. The holelike center has S = 1/2 and consists of a hole shared equally by two adjacent oxygen ions in the otherwise perfect lattice. Spin-Hamiltonian parameters, obtained from complete sets of angular dependence data, are presented for each of the centers. This work was supported by NSF Grant No. DMR-0804352.

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