University of Central Florida

Technology Available for Licensing

tt.research.ucf.edu

Extremely Non-Degenerate Two-Photon Absorption (2PA): High Coefficients with Larger-Gap Semiconductors

New patented method can improve multi-photon optical sensing methods by broadening the selection of semiconductor materials able to realize high two-photon absorption (2PA) coefficients.

Introduction

Non-degenerate two-photon absorption (ND-2PA) enables much larger 2PA coefficients than degenerate two-photon absorption (D-2PA), and applications of larger-gap semiconductors can now benefit from extremely large 2PA coefficients. This improvement can be one to three orders of magnitude higher when comparing extremely non-degenerate two-photon absorption (END-2PA), now made possible by researchers at UCF, to degenerate counterparts as demonstrated by theoretical calculations. The new advancement is based on a method to achieve END-2PA using photons in a ratio of energy difference causing the energies of individual photons to approach intermediate-state resonances, enabling higher 2PA. Realizing the benefits of high 2PA beyond narrow-gap semiconductors, to larger gap semiconductors with direct bandgaps including CdTe, GaAs, ZnSe, ZnO, and ZnS, can be useful for optical switching, infrared (IR) detection, imaging, and applications of lasers and amplifiers based on two-photon gain.

Technical Details

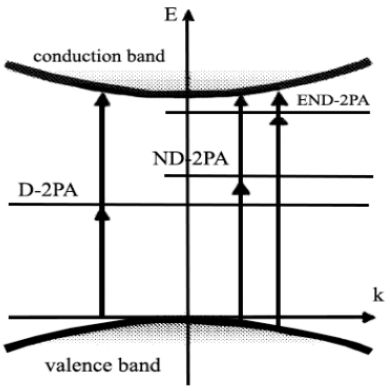
The method calls for simultaneously irradiating, continuously or pulsed, a semiconductor material substrate with two photons of different energy, wherein each photon's energy is less than the bandgap energy and the aggregate energy of the photons is greater than the bandgap energy. This irradiation reversibly changes a material property, such as optical transmittance or electrical conductivity, of the semiconductor material substrate to achieve higher 2PA when the ratio of photon energies for a higher energy photon (with at least about 75% of the bandgap energy) to a lower energy photon (with no greater than about 25% of the bandgap energy) is at least about 3.0.

UCF Inventors

Eric Van Stryland, Ph.D.; David J. Hagan, Ph.D.

Inventors Publication

Cirloganu, C. M., Padilha, L. A., Fishman, D. A., Webster, S., Hagan, D. J., & Van Stryland, E. W. (2011). Extremely nondegenerate two-photon absorption in direct-gap semiconductors [Invited]. Optics Express, 19(23), 22951-22960. Retrieved from http://www.creol.ucf.edu/Research/Publications/5097.pdf



Benefits

- Higher 2PA

Applications

- Optical sensing: multi-photon optical sensing methods
- Optical switching
- Infrared (IR) detection
- Lasers and amplifiers based on two-photon gain

Tech Fields

Optics & Lasers, Semiconductors

Keywords

non-degenerate two-photon absorption, ND-2PA, multi-photon optical sensing, optical switching, infrared detection, IR detection, two-photon gain, direct bandgap semiconductor

US Issued Patent

8,778,703 B2

If you or your company are interested in this opportunity, Contact:

John Miner | 407.882.1136 | John.Miner@ucf.edu | Tech ID#32621
UCF Office of Technology Transfer | 12201 Research Parkway, Suite 501, Orlando, FL 32826