Erbium Modified III-V Semiconductors as Photoconductors in the Terahertz Region

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BRIEF DESCRIPTION

A composite material system with embedded Erbium-Arsenic (ErAs) nanostructures for 1030nm operation with higher dark resistance and ultrafast carrier lifetime.

BACKGROUND

Spectroscopic applications in the terahertz (THz) region are used in broadband imaging and in the detection of chemical and biological hazards. Photoconductors are the most frequently used devices for THz generation and detection in the terahertz region. The terahertz region is located between the infrared and microwave wavelengths on the electromagnetic spectrum, and requires that spectroscopic devices have ultrafast carrier lifetime and high electrical resistance in the dark. Spectroscopic applications have been achieved for 800nm wavelength operation, but fiber-laser comparable systems that operate at a higher wavelength have not been explored.

DESCRIPTION

Researchers at UC Santa Barbara have developed a composite material system with embedded Erbium-Arsenic (ErAs) nanostructures for 1030nm operation with higher dark resistance and ultrafast carrier lifetime. The system utilizes a rare earth (RE) element, Erbium, to create a III-V semiconductor with the desired bandgaps. When the solubility limit of the RE element is reached, RE-V nanostructures are formed within the III-V semiconductor matrix. These nanostructures trap photo-carriers to reach ultrashort lifetimes and the Fermi levels of the RE-V compounds pin somewhere within the III-V bandgaps to help increase the dark resistance.

ADVANTAGES

- Reduced cost of photoconductor materials and THz system overall
- Compact fiber lasers allow for reduced THz system size
- Increased dark resistance

APPLICATIONS

- Photoconductors
- Broadband imaging
- Detection of chemical & biological hazards

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OTHER INFORMATION

KEYWORDS

terahertz, III-V, photoconductor, indansens

CATEGORIZED AS

- **Imaging**
  - Other
  - Remote Sensing
- **Sensors & Instrumentation**
  - Other

RELATED CASES

2015-332-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Epitaxial Laser Integration on Silicon Based Substrates
- Quantum Dot Photonic Integrated Circuits
- Misfit Dislocation Free Quantum Dot Lasers

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