Optically Active Dilute-Antimonide III-Nitride Nanostructures for Optoelectronic Devices

Technology #7593

Optoelectronics are devices that can convert electrical signals to light energy, or vice-versa. Light emitting diodes (LEDs) are one example of devices that have been gaining greater adoption because of their improved efficiency. Gallium Nitride (GaN) is a semiconducting material with great potential in many optoelectronic devices and could even replace silicon in some applications because GaN can operate at higher temperatures. Standard GaN materials have proven effective in creating blue light LEDs, but there has been trouble in using GaN for devices that emit/detect higher wavelengths of light.

Tuning of spectral and optical properties for semiconductors

This technology concerns new, GaN-based materials with a reduced bandgap. By adjusting the concentration of an additional element into a growing crystal, the bandgap can be tuned from 3.4 eV for a standard GaN semiconductor down to 2 eV. This control over the material composition allows the tuning of room-temperature emission between 365 to 600 nm. These materials are epitaxially grown on silicon substrates into thin films, nanowire arrays, and even quantum dots in GaN nanowires.

Applications

- LEDs
- Lasers
- Photodetectors
- Solar photovoltaics

Advantages

- Broad range tuning of bandgap for GaN-based semiconductors
- LED emission in deep visible spectral range
- Operates at room temperatures

Inventors

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