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Single-Crystal Erbium Chloride Silicate Nanowires as a Novel Silicon Based Light Emitting Material at 1.53 µm

AzTE Case # M10-130

Inventors

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Background

Er-doped silicon and silicon-rich silicon oxide have been investigated extensively for the potentially important applications in Si-compatible photonic devices such as silicon-based lasers, or optical amplifiers, owing to the fact that the emission wavelength of 1.53 µm lies in the minimum loss region of silica-based optical fibers. However the concentration in Si or SiO_2 is typically limited to below 1×10^{20} cm^{-3} due to concentration quenching. These disadvantages make the Er-doped Si or SiO_2 systems unsuited for high-gain practical applications.

Invention Description

Researchers at ASU have developed a technology that focuses specifically on the growth of the single crystal materials Erbium Silicate (ErSiO) and Erbium Chloride Silicate (ErClSiO) directly on Silicon. By growing these materials using chemical vapor deposition they will contain 2-3 orders of magnitude more Erbium ions than the silicon based light emitting materials that the market currently uses. Further, these materials are single crystals opposed to poly or amorphous crystals. This translates into increased light emission strength and a higher gain than other Silicon based materials. The newly developed single crystal materials are thinner and smaller which allow for electrical injection increasing the performance and reliability of all Silicon based light emitting devices (like lasers and LEDs) while reducing production costs and will be a significant incremental improvement to all products utilizing silicon photonics, silicon based lasers, and optical devices.

Potential Applications

- Silicon-based lasers, silicon photonics, optical devices, solar cells
- Computer processing chips used in the manufacture of computers, servers, and other electronic devices
- LEDs and lasers

Benefits and Advantages

- 2-3 orders of magnitude more erbium ions than currently available materials
- Increased light emission strength and higher gain
- Electrical injection possible which increases performance and reliability while reducing production costs
- Allows monolithic integration

Intellectual Property Status:

Patent Pending

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