High Concentration Doping of Semiconductors through In-situ Deposition
Technology #14916

Applications

- Optical, electrical, or electro-optical devices (HFETs, LD, and LEDs)
- Germanium light emitters

Problem Addressed

Some doping methods such as ion implantation, severely damage the lattice of the semiconductor material and this damage worsens device performance. The standard methods used to correct the lattice damage often reverse the deposition process itself by allowing the dopants to diffuse out of the film.

Technology

The deposition process is completed in two steps. First, a solid state diffusion source is deposited on the surface of the film in alternating layers of the dopant and an encapsulating semiconductor. Second, after removing the substrate from the reactor, an anneal is performed to drive in the dopants by diffusion from the source layer into and throughout the semiconductor film. A possible third step consists of removing the encapsulating material of the diffusion source. What results is a single highly doped semiconductor film, without any defects caused by introducing dopants beyond the In-situ limit. the lattice damage which is standard to doping.

Advantages

- In-situ doping minimizes damage from externally adding dopants to semiconductor and thus maintains lattice structure and a high fraction of activated dopants

Categories For This Invention:

- Electronics & Circuits
- Semiconductors & Integrated Circuits
- Semiconductor Manufacturing

Intellectual Property:

High-concentration active doping in semiconductors and semiconductor devices produced by such doping
Issued US Patent
9,692,209
High-concentration active doping in semiconductors and semiconductor devices produced by such
doping
US Patent Pending
2018-0198256

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**Publications:**
High n++ Doped Germanium: Dopant In-Diffusion and Modeling
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pp.228,230, 14-16 Sept. 2011
Toward a Germanium Laser for Integrated Silicon Photonics
IEEE
October 13 2009, 124-131

**External Links:**
Microphotonics Center
https://mphotonics.mit.edu/
Electronic Materials Research Group
http://photonics.mit.edu/

**Image Gallery:**

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