Controlling Semiconductor Interfaces
Technology #15888

Applications
This technology can be used to integrate group III-V semiconductors on silicon-germanium for making:

- high-efficiency solar cells
- lasers
- high-speed transistors
- and light-emitting diodes (LEDs)

Problem Addressed
Integrating thin films of different semiconducting materials on a conventional silicon-germanium substrate gives rise to high performance devices with lower cost and higher reliability. However, the difference in the structural properties of these materials from the substrate makes the integration process challenging often leading to defects in the devices manufactured.

Technology
This technology enables controlled growth of a semiconductor material (e.g., Gallium Arsenide Phosphide) on a silicon-germanium substrate. Instead of simply matching the lattice structure of the two materials at the interface boundary, the material fabrication methodology involves specially crafted strain-engineering technique that disrupts defect formation. The technique when augmented with proper initiation condition results in a substantial reduction in the defect density. This opens up a huge opportunity in the manufacturing of semiconducting materials with overall improved capabilities and device performance.

Advantages
- Low defect density, Increased yields
- Improved material manufacturing process
- Applicable for a wide range of material composition
- Enabler for high performance devices

Categories For This Invention:
Electronics & Circuits
Semiconductors & Integrated Circuits
Design & Fabrication
Semiconductor Manufacturing
Energy
Solar
Photovoltaics
PV Processing
Silicon PV
Thin Film PV
Materials
Thin Films

Intellectual Property:
Controlling GaAsP/SiGe interfaces
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9,490,330

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Publications:
Controlling Epitaxial GaAs(x)P(1-x)/Si(1-y)Ge(y) Heterovalent Interfaces
Electrochemical Society Transactions
2012

External Links:
Fitzgerald’s Group
https://dmse.mit.edu/faculty/profile/fitzgerald

Image Gallery: