Dislocation Reduction in Silicon by Application of Cyclic Thermal Stress
Technology #14086

Applications

Dislocation reduction in silicon during multicrystalline photovoltaic (PV) cell manufacturing increases cell efficiency 10-40% relatively.

Problem Addressed

Many solar cell manufacturers use multicrystalline silicon based technology to lower production costs. However, dislocations, grain boundaries, and impurities in multicrystalline silicon cause carrier recombination and lifetime losses. By applying thermal stress, this technique decreases the dislocation density of the multicrystalline material.

Technology

High temperature cycling creates small thermal gradients across a material. Non-linear thermal gradients may be applied to create shear stress via uneven thermal expansion. Repeated application of these shear stresses can aid dislocation motion and annihilation throughout the material. The thermal cycling can be accomplished through a temperature-programmable furnace or several heat zones that the sample is moved through. By decreasing the dislocation density in this way, the solar cell’s relative efficiency can increase by 10-40%.

Advantages

- Increases efficiency
- Easily implemented into current manufacturing

Categories For This Invention:

Energy
Solar
Photovoltaics
Silicon PV

Intellectual Property:

Method to reduce dislocation density in silicon using stress
Issued US Patent
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Publications:
Strain Engineering of Magnetic States of Vacancy-Decorated Hexagonal Boron Nitride
Applied Physics Letters
Lett. 103, 102401 (2013);

External Links:
Photovoltaics Research Lab
http://pv.mit.edu/

Image Gallery: