Fabricating High-Power Solar Cells with a Novel Boron Emitter

A simplified, cost-saving method for producing n-type commercial solar cells

This technology is a novel fabrication process that offers a cost-effective means of building innovative, high-efficiency solar cells. Specifically, this process improves the development of *n*-type solar cells, or those that include phosphorous in their silicon (Si) construction to support the flow of electric current. The fabrication method developed by Georgia Tech researchers includes a novel selective boron emitter for commercial *n*-type Czochralski (Cz) solar cells that facilitate an efficiency greater than 24%, demonstrating the potential of this technology to compete in the next generation of industrial solar cells.

The two-step selective boron emitter is achieved by a combination of ion implantation and atmospheric pressure chemical vapor to fabricate *n*-type Cz front junction Si solar cells with screen-printed contacts on the front and tunnel oxide passivated contact (TOPCon) on the rear. This innovation also enhances the TOPCon component of the solar cell by reducing its recombination velocities, thereby improving the overall efficiency of the cell. Higher efficiency solar cells reduce the surface area requirement for their installation and also save costs on their production and use overall.

Summary Bullets

- **Efficient**: Demonstrates a competitive level of efficiency road map of over 24.2%
- **Cost-effective**: Offers a simplified approach for fabricating TOPCon solar cells while still maintaining their efficiency
- **Sustainable**: Improves upon current renewable energy solutions that provide alternatives to fossil fuel–based energy consumption

Solution Advantages

- **Efficient**: Demonstrates a competitive level of efficiency road map of over 24.2%
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Potential Commercial Applications

Solar cells have a wide range of applications for commercial and residential energy production. Some examples of their use in these settings are:

- General electricity
- Fans
- Batteries and chargers
- Water heaters

Background and More Information

Growth in the solar energy market is driven by the increasing environmental concerns for greenhouse gas emissions and consumption of fossil fuels. Though *n*-type solar cells are more reliable and generate higher levels of power, they are limited by high surface recombination velocities. Georgia Tech's novel selective boron emitter improves upon the TOPCon solar cell, taking advantage of its manufacturing process that is already more simplified and less costly than other types of solar cells. This new fabrication method further enhances the TOPCon cell's efficiency while keeping overall production costs low.

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IP Status

<p class="MsoNormal">Patent application has been filed<o:p></o:p></p>: US62/891591

Publications

[Boron Selective Emitter formation with un-metallized J0e of 13fA/cm2 for Silicon Solar Cell Applications](#), 47th PVSC IEEE, Oral Presentation, 2020 - June 15, 2020

Images

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