Sandia National Laboratories

Heterojunction for Multi-Junction Solar Cells

BENEFITS

Forms an efficient 0.95-1.2 eV bandgap photodetector for use in a multifunction solar cell

Contacting layers of p-type GaAs overcomes the limitation of a low electron diffusion that occurs in homojunctions or heterojunctions formed in part from p-type InGaAsN

The n-type InGaAsN and p-type GaAs provide a substantial increase in open-circuit voltage and short-circuit current as compared to homojunctions and heterojunctions formed in part from p-type InGaAsN

In space applications, an increased solar cell efficiency is advantageous for increasing the available electrical power or reducing satellite mass and launch cost

INTELLECTUAL PROPERTY

US PATENT #6,252,287
SD# 6376

TECHNOLOGY SUMMARY

Sandia National Laboratories has created a semiconductor p-n heterojunction for use in forming a photodetector that has applications for use in a multi-junction solar cell and detecting light at an energy greater than 0.95-1.2 eV.

This semiconductor is made up of a layer of indium gallium arsenide nitride (InGaAsN) with n-type doping that is epitaxially grown in contact with a layer of gallium arsenide (GaAs) with p-type doping. The InGaAsN/GaAs semiconductor p-n heterojunction of the present invention can be used in combination with semiconductor p-n homojunctions of conventional designs to form an efficient multi-junction solar cell.

POTENTIAL MARKET APPLICATIONS

Generation of electricity for space photovoltaic applications

Terrestrial high-concentration photovoltaic applications

TECHNOLOGY READINESS LEVEL

Sandia estimates this technology at approximately TRL 5. Key elements of this technology have been demonstrated in relevant environments.

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