

Silicon Solar Cells that Absorb Solar Photons Above 2.2 eV and are Transparent to Solar Photons Below 2.2 eV

Tech ID: 33557 / UC Case 2022-619-0

ABSTRACT

Traditionally, land can be used for either crop growth or energy production. This technology optimizes the efficiency of land use by combining both. Researchers at the University of California, Davis have developed solar cell designs that absorb only specific solar photons (> 2.2 eV) to create electricity, while letting through beneficial light (< 2.2 eV) for efficient crop growth.

FULL DESCRIPTION

The technology is an agrivoltaic solution involving solar cells that generate electricity by absorbing photons with energy greater than 2.2 eV and are transparent to photons with energy less than 2.2 eV. As such, these cells enable both energy production and crop growth on the same land by effectively separating the spectral light required for each. Two candidate materials, gallium phosphide (GaP) and a specially thinned silicon (Si) solar cell, are utilized to this end.

APPLICATIONS

- ▶ Agrivoltaic market: enabling efficient combination of power generation and food production
- ▶ Bioswales, water retention ponds, floating solar over lakes and canals (to possibly limit eutrophication)
- ▶ Solar energy sector: offering a new type of semi-transparent solar cell
- ▶ Farming industry: providing an innovative solution for efficient crop growth and energy production

FEATURES/BENEFITS

- ▶ Significant increase in land use efficiency by coupling energy production and crop growth
- ▶ Solar cells let through beneficial light for crops, promoting healthy growth
- ▶ Low-cost manufacturing with commonly used materials such as Si
- ▶ Fine-tuning of light separation to suit different crops
- ▶ Overcomes the shading issue of conventional solar cells which impedes crop growth
- ▶ Addresses the challenge of feeding a growing global population via green energy production

PATENT STATUS

CONTACT

Andrew M. Van Court
amvancourt@ucdavis.edu
 tel: .



INVENTORS

- ▶ Najm, Majdi A
- ▶ Woodall, Jerry M.

OTHER INFORMATION

KEYWORDS

agrivoltaics, food production, energy production, gallium phosphide (GaP), light separation, silicon (Si) solar cells, solar energy

CATEGORIZED AS

- ▶ **Agriculture & Animal Science**
 - ▶ Devices
 - ▶ Other
- ▶ **Energy**
 - ▶ Other
 - ▶ Solar
- ▶ **Environment**
 - ▶ Other
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University of California, Davis

Technology Transfer Office

1 Shields Avenue, Mrak Hall 4th Floor,
Davis, CA 95616

Tel:

530.754.8649

techtransfer@ucdavis.edu

<https://research.ucdavis.edu/technology-transfer/>

Fax:

530.754.7620

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