Method To Synthesize Colloidal Iron Pyrite Nanocrystals And Fabricate Thin Film Solar Cells Of Same

Tech ID: 22007 / UC Case 2010-158-0

BRIEF DESCRIPTION

A scheme to produce colloidal nanocrystals of iron pyrite (FeS2) and a p-n heterojunction thin film solar cell based on sintered films of these nanocrystals on flexible substrates.

FULL DESCRIPTION

Pyrite iron persulfide is an under-researched, extremely promising semiconductor for use as the light-absorbing layer in thin-film photovoltaics (PV). University researchers have invented the first method to produce phase pure, colloidal pyrite nanocrystals on a large scale for use in thin film solar cells. Pyrite nanocrystals (NCs) are of particular interest for low-cost solar energy conversion because of the prospect of fabricating inexpensive, large-area modules by the roll-to-roll printing or spraying of NC “solar paint” onto flexible metal foils. Nanocrystal-based devices can achieve excellent manufacturing scalability at lower cost ($/Wp) than conventional single-crystal Si and existing thin film technologies. Furthermore, university researchers have conceived of all the steps needed to manufacture an efficient, low-cost p-n heterojunction solar cell from this pyrite paint. Nanocrystalline pyrite films are made by dip coating, inkjet printing, or doctor blading the paint/paste onto stainless foil. These films are sintered in special gas mixtures to yield stoichiometric polycrystalline pyrite films with carrier diffusion lengths that are significantly longer than the average optical absorption length. The surfaces of the films are then passivated chemically to increase the surface band gap and reduce the surface recombination velocity. The heterojunction partner is a window layer deposited by chemical bath deposition (CVD) or another method. The transparent top contact is made by sputtering, CBD, ALD, or another method. Since this pyrite cell design mimics commercialized CdTe and CIGS technology, this technology can be quickly incorporated into existing production lines.

SUGGESTED USES

Terawatt level energy generation.

ADVANTAGES

The great potential of pyrite lies in its superior scalability to terawatt (TW) levels of solar energy conversion than existing thin film technologies and its much lower cost than silicon.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,862,617	01/09/2018	2010-158

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OTHER INFORMATION

KEYWORDS

Colloidal iron pyrite, Solar cell, Thin-film, CdTe, CIGS, Nanocrystals

CATEGORIZED AS

- **Energy**
  - Solar
- **Materials & Chemicals**
  - Nanomaterials

RELATED CASES

2010-158-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Iron Pyrite Thin Films From Molecular Inks

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