University of Colorado
TECHNOLOGY TRANSFER OFFICE

Economical Pyrite-Based Solar Cells

UNIVERSITY OF COLORADO

TECHNOLOGY TRANSFER OFFICE

Boulder + Colo. Springs
4740 Walnut Street
Suite 100
Campus Box 589
Boulder, CO 80309

(303) 492-5647

Denver + Anschutz
Medical Campus
12635 E. Montview Blvd
Suite 350
Campus Stop F411
Aurora, CO 80045

303-724-0221

www.cu.edu/techtransfer

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Case Manager:
Ted Weverka
ted.weverka@cu.edu
Ref # CU2969B

Background

The first generation of solar cells, used in 90% of today's cells, have a focus of high efficiency. These cells use a single p-n junction to extract energy from photons, and are manufactured from silicon semiconductors. This allows for about 30% efficiency, but resulted in a price too high to compete with fossil fuels (payback time of about 5-7 years). The second generation of solar cells focuses on low production costs using thin film cells, which resulted in much lower efficiency rates. The third generation of solar cells has not yet been created, but focuses on combining the high efficiency of the first generation with the low cost of the second generation.

Pyrite has been demonstrated as a battery material for high energy density and has potential to be utilized in third-generation solar cells. However, it is not an ideal material in its natural form due to its high percentage of impurities; it is also costly and time-consuming to synthesize.

Technology

A research team at the University of Colorado at Boulder led by Conrad Stoldt is developing a pyrite-based solar cell. By developing nanostructured pyrite and synthesizing it as the active layer in photovoltaic cells, the team hopes to create an alternative material for use in photovoltaics. Dr. Stoldt's team found that by cycling at elevated temperatures, pyrite composite electrodes underwent conversion reactions and voltage plateaus were observed.

Benefits

Pyrite matches well with the solar spectrum, and has a very high absorption coefficient, making it an ideal candidate for photovoltaics. Furthermore, it is more economical than the silicon that is currently used. Once completed, the technology has the potential to provide a cheaper and more efficient alternative to silicon for use in photovoltaics.

Key Document

"Thermo-Electrochemical Synthesis of FeS2 In-situ." Provisional patent application filed November 28, 2011; available under CDA.