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Methods to Produce Pyrite Semiconductor Materials

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Background

Although the cost of solar cells has dropped significantly in recent years, the largest barrier to the development of terawatt-sized, utility scale solar projects is cost. Many utility scale solar projects have been built from solar modules that utilize cadmium telluride, thin film materials. These modules are popular because they cost less than silicon products, but they degrade much faster. Cadmium telluride is a rare earth metal in limited supply. Currently, almost all of the material that is mined each year is used in manufacturing, limiting growth in the quantity of solar cells produced. Additionally, this material is toxic, and its use poses potential environmental hazards.

Invention Description

Researchers at Arizona State University have developed a method to produce pyrite semiconductor materials. Pyrite is an abundant element that is inexpensive to mine and easily purified. Use of this process and material pose no environmental hazards. The technique can produce high quality semiconductor film at relatively low temperatures; between 300° to 400°C. Pyrite is an excellent material for large area semiconductor application (including Photovoltaic) because it has a desirable 0.95 eV band gap and has a high absorption coefficient.

Potential Applications

- Solar cells
- Light emitting diodes
- Semiconductors

Benefits and Advantages

- **Lower Costs** – Basic earth element that is easy to find, mine, and purify
- **Larger Projects** – Lower cost will speed adoption of terawatt, utility scale solar
- **Non-toxic** – Poses no environmental hazards