Main materials of chemical solar cells

With that in mind, this review aims to provide an analysis of the advancements in photovoltaic cell materials, with a particular focus on silicon-based, organic, and perovskite solar cells. Each of these materials bring unique attributes and challenges to the table, collectively shaping the current and future landscape of solar energy technology.

Cadmium telluride, a compound that transforms solar energy into electrical power, is used primarily in thin-film solar panels "s valued for its low manufacturing costs and significant absorbance of sunlight. Copper indium gallium selenide (CIGS) is another material for thin-film photovoltaic cells. Its advantage lies in its high-efficiency rates relative to other thin-film ...

The scalable and cost-effective synthesis of perovskite solar cells is dependent on materials chemistry and the synthesis technique. This Review discusses these considerations, including selecting ...

Silicon is the main material for solar cells because its properties are well-known and it has established manufacturing methods. The industry has developed monocrystalline and polycrystalline solar cells from silicon. Monocrystalline cells are more efficient and last longer.

The different photovoltaic cells developed up to date can be classified into four main categories called generations (GEN), and the current market is mainly covered by the first two GEN. The 1GEN (mono or polycrystalline silicon cells and gallium arsenide) comprises well-known medium/low cost technologies that lead to moderate yields.

After all, silicon makes up about 25.8 percent of Earth"s crust, making it a main player in solar panel manufacturing materials. Today, solar cells are about 22 percent efficient. This highlights how crucial material choice is. Traditional silicon-based solar cells turn about 1.1 eV from sunlight into electricity, losing the rest as heat.

However, silicon solar cells are not yet economically competitive with fossil fuels, necessitating further cost reduction. Research explores alternatives like organic/polymeric SCs, perovskite, quantum dot cells, dye-sensitized solar cells (DSSCs), and multi-junction cells to achieve high conversion efficiency at lower expenses [15], [16]. To ...

We summarize the fundamental science of PVScs, Shockley-Queisser limit, generations, technological devices including (heterojunctions, multijunctions, tandem, multiple exciton generation, quantum dots, panels, arrays and power systems).

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