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Solar Intercrossed Advanced Technology SiC: Capturing Solar (Light + Thermal) Energy

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Abstract

The VTIR layer, "Visibly Transparent Infrared Reflective," can divide the incoming sunlight into two distinct regions: visible and infrared. It does this by reflecting the photons whose wavelength is identical to that of infrared while allowing the visual component of the electromagnetic spectrum to pass through it. Because of this, the layer can separate the incoming sunlight into two distinct regions: the visible and the infrared. This layer is generated on the surface of solar modules, which are structured to concentrate the reflected infrared radiation onto a thermal absorber tower. This allows for the formation of this layer. Solar modules are protected from overheating by being limited in their exposure to unfiltered regions of the electromagnetic spectrum corresponding to visible light. Because of this, they have not lost any of their efficacies. A thermal exchanger is used to transfer the thermal energy that was initially given to the tower into a heat-conducting fluid. This is used in producing electricity, hydrogen, or energy storage in a thermal storage tank, steam boiler, or electrolyzer, respectively. The azimuth and zenith angles of the sun are inputs sent to the sophisticated controller that is built on artificial intelligence and machine learning by the relevant sensors. The system will then provide real-time instructions for each solar module or table, instructing it to modify its tilt angle along two axes based on location. This guarantees that the most significant quantity of the sun's rays will strike it and be reflected toward the tower. Because of this, it is projected that the system's overall efficiency will be increased by around fifty percent per square meter by vertically integrating two different types of solar technology.

Keywords

Solar, Intercrossed, Advanced, Technology, Silicon carbide, Solar, Light, Thermal, energy

Introduction

Environmentally friendly power sources additionally name as non-ordinary power, are origin that are consistently renewed via regular cycles [1]. Affecting instance, sun-oriented energy, bio-energy, wind energy, and bio-powers developed support capably, hydropower and so forth, are a portion of the instances of sustainable power sources Renewable energy framework changes over the power found in daylight, current of air, falling-water, ocean waves, geothermal hotness, or biomass into a structure, we might utilize like hotness or power [2].

The majority of the sustainable power comes either straight forwardly or by implication from luminary and wind and can never be depleted, and along these lines they are bellowed inexhaustible [3]. Nonetheless, the vast majority of the world's energy spaces of origin are gotten from regular sources-petroleum derivatives like coal, oil, and flammable gases [4]. These powers are regularly named non-environmentally friendly power sources [5]. Albeit, the accessible amount of

these powers is incredibly enormous, they are by and by limited thus will on a basic level 'run out 'sooner or later renewable energy sources are basically streams of energy, while the fossil and atomic fills are, generally, supplies of energy [6].

Figure 1 shows the design of a nano-mesh pattern for VTIR coatings. Infrared radiation cannot pass through, but visible light can. It is composed of array of nano scale pores that are large enough to enable visible light to pass through, but small enough to block infrared light. Based on rigorous coupled-wave analyses, this design improves upon the earlier work that simulated the reflectance of metallic nano structured material based films in the mid-infrared utilizing coupled-wave analysis [2]. According to simulations, an isolated nano-dot pattern had a substantially lower mid-infrared reflectance than an interlinked nano-mesh pattern, which had a high reflectance close to 100%. Although a single metal layer nano-mesh coating can be tuned for high infrared reflectivity by changing the coating thickness and hole size, its visible transmittance remained insufficient due to a trade-off between infrared reflectance and visible transmittance. A tri-layer OMO structure (TiO_2/Au/TiO_2), combined with a nano-mesh pattern design, and further increases the visible transmittance while not compromising radiative heating performance. A nano-mesh pattern with 760 nm holes was designed to exhibit the highest infrared reflectance of all hole sizes when using nano-mesh-OMO tri-layer coating with a 18 nm, 12 nm, and 12 nm thickness.

Energy from Renewable Resources

Radiant energy emitted by the sun, wind power, energy generated by biomass, hydro energy, geothermal power, and wave and tidal energy. In this invention, solar, wind, bio, and hydro energy are explored for their potential applications in India [7].

Sun powered energy

Sun-powered vitality has been the most promptly accessible and complimentary wellspring of energy since ancient times. It is assessed that the oriented point is identical to more than 15,000 times the world's yearly business energy utilization arrives at the earth consistently. India gets sunlight-based power in the district of 5 to 7 kWh/m^2 for 300 to 330 days a year. This energy is adequate to set up a 20 MW sun-based power plant per square kilometer land region. Sun-powered energy can be used through two unique courses: Sun-based warm course and sun-based electric (Sun-oriented photovoltaic) courses [8]. The sun-based warm approach utilizes the sun's hotness to create boiling moistness or air, cook fare, dry fabrics, and so forth. Sun-based photovoltaic utilizes the Sun's hotness to generate power for lighting quarters and structures, steering engines, siphons, electric apparatuses, and lighting.

Sun based thermal energy

Application with the aid of sunlight-based authorities and beneficiaries known as sunlight-based warm gadgets, solar-powered energy may be converted into nuclear power as part of the sun-based warm course. The solar-thermal machines may be separated into the following three classifications: Low-grade warm apparatuses with a maximum temperature of one hundred degrees Celsius [9]. Heating Equipment of middle-of-the-road quality may reach temperatures between 100 and 300 degrees Celsius. High-quality heating equipment with temperatures over 300 degrees Celsius. In traditional and contemporary applications, low-level solar-powered heating devices are used in sun-based moistness radiators, air-warmers, cook stoves, and dryers.

Sun oriented water radiators

Considerable solar-powered moistness heating methods have two introductory segments: a collector and a storehouse tank. The level plate gatherer is the most well-known authority (Figure 2 for further information) [10]. A light, flat, rectangular receptacle with a plain exterior that encounters the sun and is fixed on the shelter of a structure or residence is what it consists of the water or other liquid that has to be heated is transported through the box using a system of little cylinders similar to that used for a radiator fluid arrangement. The cylinders are attached to a protection plate with special coatings to withstand the heat. The authority becomes more heated, transferring heat to the fluid as it moves through the cylinders. The water that has been heated is stored in a tank that is covered and protected. It is like water warmer, although

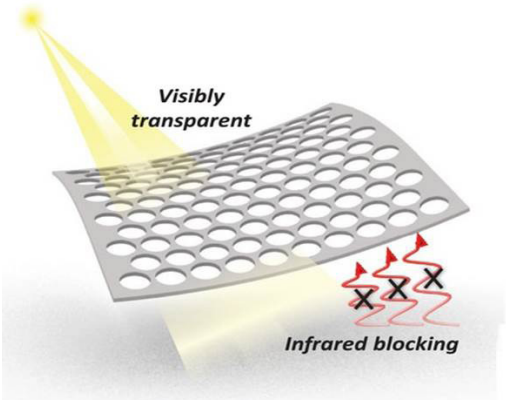

Figure 1: Nano-mesh pattern design for the VTIR coating.

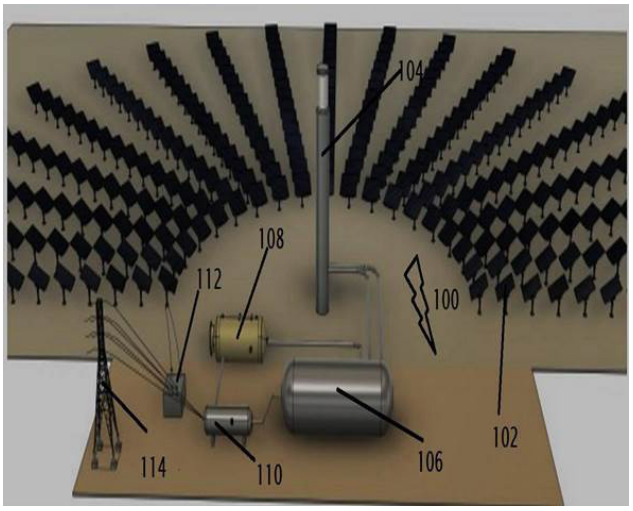

Figure 2: Pictorial field view representation/setup in a very simplified and diagrammatic form of a solar energy plant in accordance with the present invention.

more significant in size. In approaches that use liquids, warmth is transferred from the superheated liquid to the moisture accumulated in the tank via a series of cylinders connected in a loop.

Solar photovoltaic (PV)

The technical word for electricity generated by the sun is called photovoltaic. "Light" is denoted by the word "photograph," and "electric" is indicated by the phrase "voltaic". Silicon, a component that generally distributes electrons when exposed to light, is the most common material used to construct PV cells. The intensity of the light that falls on silicon cells is directly proportional to the number of released electrons. A network of metal is wrapped around the silicon cell, and it is this network's job to direct the passage of electrons so that an electric current may be created. Batteries or DC devices are used to route this current. Consistently, one cell generates around 1.5 watts of force. Individual cells are combined to form a sunlight-based charger or module, which can cause anything from three to one hundred and ten watts of electricity [11]. A sun-based cluster may be created by connecting boards in series and parallel (Figure 2); this cluster can supply any amount of wattage that the available space can accommodate. Modules are typically developed to provide electricity at a voltage of 12 volts. PV modules are ranked according to the maximum amount of energy they generate in watts during the early afternoon hours of a sunny day (Figure 3).

PV tracking systems

It is an alternative to the PV boards that are permanently installed. PV global positioning frameworks are installed and equipped with the following systems to track the sun as it moves across the sky. PV international positioning frameworks are sometimes referred to as PV tracking systems [12]. These global positioning systems are entirely self-sufficient in terms of electricity and have the potential to boost output by forty percent. Back-up techniques are essential because photovoltaic approaches can merely induce electricity when the sunshine is shimmering. The two considerable standard approaches for supporting solar-powered electrical strategies are combining the approach to the utility grid and reserving excess electricity in flurries for usage in the evening, on cloudy days, or when the sun isn't shining as brightly as it usually would.

Performance

The implementation of a solar-energy compartment is evaluated according to how efficiently it converts sunlight into electricity. The sun's rays, which contain a certain kind of energy, may generate usable electricity. Still, a significant amount of this energy is either reflected or used up by the components that make up the cell (Figure 4). Therefore, a standard retail solar enclosure has an efficiency of 15%, which indicates that roughly one-sixth of the rays that hits the cell is converted into usable electricity. Low efficiency means that larger clusters are necessary, which means more significant investment expenses are incurred. It is essential to bring to your attention that the primary sunlight-based cells worked on throughout the 1950s had an efficiency of less than 4% (Figure 5).

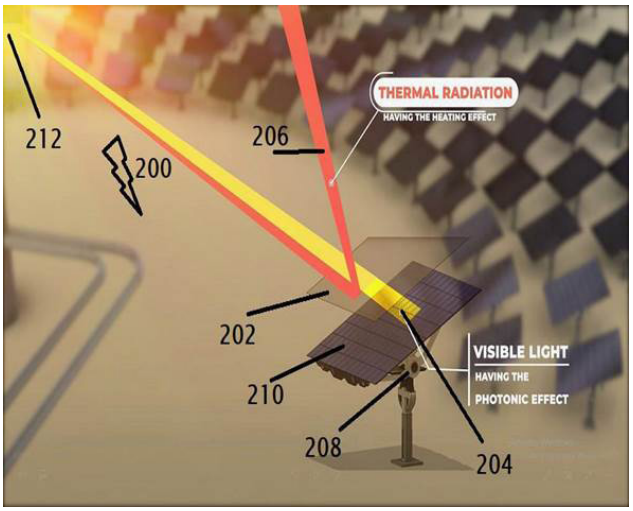

Figure 3: Working of VTIR layer deposited on the solar modules arranged on the table.

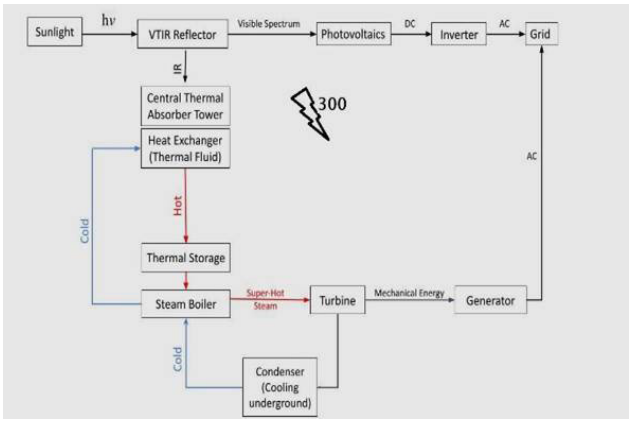

Figure 4: Block diagram of the flow of energy in the proposed invention/ model.

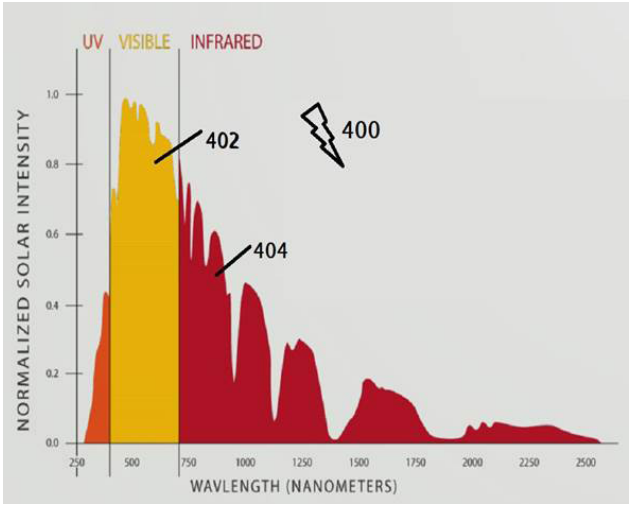

Figure 5: Solar energy distribution.

Conclusion

The objective of the invention is to maximize the conversion efficiency of solar energy by vertically integrating two major technologies in solar i.e., solar PV and concentrated solar tower power. This is to increase the overall efficiency of solar energy extraction per unit area of land up to around 50%. The other objective of the invention is to use the same incoming solar irradiance to power solar PVs and concentrated solar tower power at the same time such that both of them could extract energy out of it simultaneously. It is to have a provision of versatile storage of energy in various forms which may include thermal conductive liquid storage in an insulated container or storage of captured energy in the form of hydrogen. This is to extract the stored energy as per the requirement into a usable form of energy such as electrical energy.

Acknowledgements

None.

Conflict of Interest

None.

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