

Who is Professor Xiao-Dong Xiang?

Prof. Xiao-dong Xiang, Chair Professor at Department of Materials Science and Engineering in Southern University of Science and Technology, is a distinguished expert of "The Recruitment Program of Global Experts". Prof. Xiang pioneered combinatorial material science at Lawrence Berkeley National Lab in 1994.

Which thermodynamic cycle is used for solar thermal power generation?

Rankine, Brayton, and Stirling cycles are commonly used thermodynamic cycles for solar thermal power generation. The integration of thermal energy storage and hybridization of solar thermal energy systems with conventional power generation systems improves the performance and dispatchability of the solar thermal systems.

How to compare the different solar thermal power generation systems?

To compare the different solar thermal power generation systems, some key characteristics/parameters are important to analyze the performance of the power generation system. Some of those parameters are discussed as follows: Aperture is the plane of entrance for the solar radiation incident on the concentrator.

How to improve the dispatchability of solar power generation system?

Therefore, it is necessary to employ either thermal energy storage (TES), auxiliary backup, or hybridize the solar power generation system with other fuel-based supplementary heating systems, which can improve the dispatchability of the solar power generation system.

How can concentrating solar thermal power systems be used?

Concentrating solar thermal power systems such as LFR and PTC can be used for digesting and captive power generation. The different qualities of steam can be withdrawn from different locations of the solar field or turbine. To overcome the fluctuation of solar energy, higher solar multiple and/or buffer thermal storage may be considered. Fig. 16.

How to integrate solar thermal energy systems with industrial processes?

The integration of solar thermal energy systems with the industrial processes mainly depends on the local solar radiation, availability of land, conventional fuel prices, quality of steam required, and flexibility of system integration with the existing process.

S. Chantasiriwan [85] used models of thermal power plants, parabolic trough collectors, oil-water heat exchangers, and feed water heaters to compare the power outputs obtained by integrating solar feed water heating systems into a thermal power plant. The results of a numerical analysis done on a case study of a 50-MW power plant show that the total heating ...

Solar thermal power plants collect and concentrate sunlight to produce the high temperature heat needed to generate electricity. Thermal energy storage (TES) ... can be used at a later time for heating and cooling applications and power generation. A photovoltaic module consists of multiple PV cells connected in series to provide a higher ...

An efficient strategy using extremely low-cost materials, i.e., carbon black (powder), hydrophilic porous paper, and expanded polystyrene foam is reported, which can provide an approach for individuals to purify water for personal needs, which is particularly suitable for undeveloped regions with limited/no access to electricity. Passive solar vapor ...

It is demonstrated that multilayer PPy nanosheets with spontaneously formed surface structures such as wrinkles and ridges via sequential polymerization on paper substrates can dramatically enhance broadband and wide-angle light absorption across the full solar spectrum, leading to an impressive solar-thermal conversion efficiency of 95.33%. Converting ...

Xiaodong Wang's 77 research works with 1,486 citations and 3,588 reads, including: Double-layered hydrogels based on phase change material and pen ink for continuous and efficient solar-driven ...

Solar energy is a green, stable and universal source of renewable energy, with wide spectrum and broad area characteristics [1] is regarded as being one of the renewable energy sources with the greatest potential to achieve sustained, high intensity energy output [1], [2].The conflict between population growth and water shortage has become one of the most ...

In addition, a comparison is made between solar thermal power plants and PV power generation plants. Based on published studies, PV-based systems are more suitable for small-scale power ...

The research on large-scale solar energy-based thermal power generation technologies in China is still in its infancy, but in foreign countries it has been going on for many years. The authors ...

The most common type of solar thermal power plants, including those plants in California's Mojave Desert, use a parabolic trough design to collect the sun's radiation. These collectors are known as linear concentrator systems, and the largest are able to generate 80 megawatts of electricity [source: U.S. Department of Energy].They are shaped like a half-pipe you'd see ...

The solar thermal power generation is attracting more and more attention as a cleaner way for power generation purpose [7]. However, at present stage, the solar thermal power generation has two major shortcomings: high capital costs and relative low thermal efficiency. On the other hand, fossil fuel fired Rankine cycle power plants which are ...

The flow control method for the solar heat collector system can maintain the frequency of the heat-conducting

oil pump unchanged within a certain time period, thus improving the stability ...

Currently, the SRC is the most widespread and commercially available power block option, either coupled to a PTC solar field working with thermal oil, and generating steam at 370-390°C and 100 bar or coupled to a CR solar field working with molten salts and generating steam at 550-600°C and 180 bar.

Based on the current solar thermal energy efficiency, an average CSP plant such as a tower solar power plant, dish Stirling, or parabolic trough plant requires the use of a land area of approximately 10 acres per megawatt (MW) of power generating capacity, which is more demanding than that for solar PV power generation (6-8 acres).

The first manner is usually adopted in solar thermal power generation. The concentrated sunlight is absorbed by the high-temperature molten salts and converted to sensible heat. ... M.R. Singh, C. Xiang, N.S. Lewis. Evaluation of flow schemes for near-neutral pH electrolytes in solar-fuel generators. *Sustain. Energy Fuels*, 1 (2017), pp. 458-466 ...

Overall, the perspectives for the future contribution of solar energy to the global energy mix are very high, as one example the possible development of solar electricity from solar thermal power plants according to the roadmap of the International Energy Agency shown in Fig. 2, with about 11% of contribution to electricity supply.

Request PDF | Solar thermal energy technologies and its applications for process heating and power generation - A review | The industrial sector accounts for more than 54% of the total energy ...

XIANG Xiaodong. Chair professor. 0755-88108948. xiangxd@sustech .cn. ... Xiang was authorized over 120 U.S. and international patents and more than 50 Chinese patents. Currently, he is interested in high throughput synthesis, screening and characterization of combinatorial material chips to explore advanced materials including metallic glass ...

Solar thermal power generation uses the sun as a source of heat. As discussed above, the energy reaching the earth's surface is mostly either infrared or visible radiation. A solar thermal plant can utilise the infrared and a small part of the visible spectrum. This energy is absorbed and used to raise the temperature of a heat transfer fluid.

Xiaodong Zhao, a collaborator and fellow UC Berkeley MS student, performed a detailed analysis of this rectification system, producing an analytical model whose results guided much of ... In solar thermal power generation applications, the .3 temporal offset of the highest daytime and lowest nighttime temperatures and relatively low

There are two ways to heat your home using solar thermal technology: active solar heating and passive solar

heating. Active solar heating is a way to apply the technology of solar thermal power plants to your home. Solar thermal collectors, which look similar to solar PV panels, sit on your roof and transfer gathered heat to your house through either a heat ...

Semantic Scholar extracted view of &quot;Carbon welding on graphene skeleton for phase change composites with high thermal conductivity for solar-to-heat conversion&quot; by Mengjie Su et al. ... To realize highly efficient solar-thermo-electric energy conversion for clean electricity power generation, ... Liang Li Xiang Yuan +5 authors Guizhen Wang.

The characteristics of different solar thermal power generation technologies and their development status at home and abroad were introduced. It has been pointed out that tower solar thermal power generation technology with molten salts for heat absorbing and storage is the most promising technology in China.

Description Dual-use devices offer a different path for more-sustainable living A fivefold increase in cooling-related greenhouse gas emissions is expected by 2050 (1) from a combination of improved standards of living, especially in countries with humid climates, and the ongoing overall warming of the planet. Alternative approaches to efficient cooling are required ...

