

# Titanium nitride solar container material

Can titanium nitride plasmonic refractory materials achieve high solar absorptance?

Metastructures of titanium nitride (TiN), a plasmonic refractory material, can potentially achieve high solar absorptance while operating at elevated temperatures, but the design has been driven by expert intuition. Here, we design a high-performance solar absorber based on TiN metastructures using quantum computing-assisted optimization.

Can titanium nitride be used as a solar absorber?

Zhang et al. only used titanium nitride to create a high-performance metamaterial solar absorber, achieving near-perfect absorption 40. However, the manufacturing process of this absorber is too complicated, involving several lithography and etching processes.

Is titanium nitride a polarization insensitivity solar absorber?

Solar absorber is a key device that converts solar irradiation into heat via photothermal conversion, which has potential applications in solar thermal power systems, and seawater desalination. In this paper, we propose a wide-angle, broadband and polarization insensitivity metamaterial solar absorber based on titanium nitride (TiN).

Can titanium nitride absorbers generate surface plasmon resonance and Fabry-Pérot cavity resonance?

Due to the mutual effect between the designed configuration and the selected materials, the proposed titanium nitride-based absorber can generate surface plasmon resonance and Fabry-Pérot (FP) cavity resonance, leading to the incident photons being strongly absorbed or scattered on the absorber surface.

Which refractory nanostructure is constituted by a tin substrate?

Our proposed configuration is constituted by a TiN substrate, an Al<sub>2</sub>O<sub>3</sub> layer as dielectric, a thin TiN layer, and topmost refractory nanostructures. TiN and Al<sub>2</sub>O<sub>3</sub> are chosen due to their high melting point. The top refractory nanostructure takes TiN nano-cuboids as an example.

Are metamaterial solar absorbers better than TM polarization?

The metamaterial solar absorber is found to still have better performance (94.7% for TM polarization and 86.6% for TE polarization) at large incidence angle of 60°. It is believed that this work will guide us in the design of high-temperature solar absorbers.

Solar absorber is a key device that converts solar irradiation into heat via photothermal conversion, which has potential applications in solar thermal power systems, and seawater ...

Titanium Nitride (TiN) film is an important hard film coating material, and is also the first industrialized and widely used film coating ...

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Titanium nitride (TiN) has been proved as an efficient, refractory plasmonic material in solar energy harvesting applications. In this paper, we demonstrate the design of a simple metastructure, including ...

This study focuses on the plasmonic properties of Titanium Nitride (TiN) and Zirconium Nitride (ZrN) nanorods as costeffective and efficient alternatives to noble metal gold (Au).

Abstract Light trapping is a crucial prominence to improve the efficiency in thin film solar cells. However, last few years, plasmonic based thin film solar cells shows potential structure to improve efficiency in ...

ACS applied materials & interfaces, volume 15, issue 34, pages 40606-40613 Design of a High-Performance Titanium Nitride Metastructure-Based Solar Absorber Using Quantum Computing ...

In this work, a refractory titanium nitride meta-surface with efficient, ultra-broadband solar energy absorption is theoretically designed and numerically demonstrated. The resulting 250-nm-thick meta ...

Titanium nitride (TiN) is an emerging plasmonic material that offers compatibility with complementary metal-oxide-semiconductor (CMOS) ...

This study presents a solar absorber based on a single TiN material, breaking the intrinsic absorption limitations of the material through synergistic design of composite nanostructures.

Titanium nitride (TiN) coated anodized aluminum oxide (AAO) converts the incident solar energy into thermal energy by the photothermal conversion and generates steam efficiently.

However, these materials are only capable of absorbing photons in the UV/near-UV range, which hinders the possibility of efficiently utilizing solar light to drive these reactions, since ...

This study proposes a solar absorber with a column-cavity structure, where the pattern layer unit is composed of a double-layer titanium nitride (TiN)...

In this study, we present quantitative investigations for describing the hot electron generation in TiN nanoshells. Au nanoshells are also ...

In plasmonic titanium nitride (TiN) nanoparticles (NPs), the surface plasmon resonance decays nonradiatively, resulting in the generation of highly ...

Titanium oxynitride (TiO<sub>x</sub>N<sub>y</sub>) thin films are fabricated using reactive magnetron sputtering. The mechanism of their growth formation is ...

In this work, we design a new solar light absorber configuration that incorporates the titanium nitride substrate, aluminum oxide layer, titanium ...

Carrier transport mechanisms of titanium nitride and titanium oxynitride electron-selective contact in silicon heterojunction solar cells Checkforupdates

High-performance passivating contact is a prerequisite for high-efficiency crystalline silicon (c-Si) solar cells. In this work, an electron-conductive, hole-blocking contact based on titanium nitride (TiN) ...

Titanium nitride (TiN) is one of the most well-established engineering materials nowadays. TiN can overcome most of the drawbacks of ...

In recent years, transition metal nitrides set the new trend in novel plas-monic materials having great attention and speci cally, Titanium Nitride and Zirconium Nitride are known for their unique ...

Carbon Nanotubes with Titanium Nitride as a Low-Cost Counter-Electrode Material for Dye-Sensitized Solar Cells+ Angewandte Chemie ( IF12.959 ) Pub Date : 13 April 2010, DOI: ...

Abstract Taking advantage of plasmonic nanostructures for light trapping in thin-film silicon solar cells has attracted ample attention among researchers. Titanium nitride (TiN) has recently been introduced ...

Generally, titanium nitride coatings are prepared by plasma nitriding [8,9], plasma ion implantation [10], physical vapor deposition and chemical vapor deposition for industrial applications. ...

The experiments demonstrate that titanium nitride nanoparticles dispersed in water have high efficiency to heat water and generate vapor than ...

Solar absorbers efficiently convert solar radiation into thermal energy through photothermal conversion, and are widely used in seawater desalination, energy storage. Titanium nitride (TiN) possesses ...

Titanium nitride (TiN) and titanium oxynitride (TiOxNy) have been employed as an electron-selective contact in both c-Si and perovskite solar cells, demonstrating their effectiveness in ...

Recently, titanium nitride (TiN) nanostructures have emerged as promising candidates for this application due to their much lower cost, and therefore greater sustainability, than structures made of ...

Broadband Hot Electron Collection for Solar Water Splitting with Plasmonic Titanium Nitride Alberto Naldoni,\* Urcan Guler, Zhuoxian Wang, Marcello Marelli, Francesco Malara, Xiangeng Meng, Lucas ...

The nanostructure of titanium nitride was synthesized and investigated as a counter electrode (CE) to replace the conventional platinum CE for dye-sensitized solar cells (DSSCs). Titanium nitride ...

2007-01-01 433 Citations38 Thermal oxidation properties of titanium nitride and titanium-aluminum nitride



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materials -- A perspective for high temperature air-stable solar selective absorber applications ...

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