

exhibit electrical outputs ranging from a few megawatts (MW) to a few hundred megawatts, rendering them suitable for diverse applications such as remote communities, industrial processes, and power supply for ships and submarines.

SNRs possess notable safety advantages, integrating passive safety systems like natural circulation and inherent shutdown mechanisms, which minimize the risk of accidents and mitigate their consequences in the event of failure. Moreover, the compact size of SNRs facilitates more manageable emergency response measures, ensuring elevated levels of safety and security.

The modular nature of SNRs allows for flexibility and scalability in energy production. Multiple small reactors can be deployed incrementally to match the energy demands of specific regions or facilities. This modular approach streamlines maintenance and upgrades, minimizing downtime and optimizing overall system efficiency. SNRs exhibit rapid deployment potential, making them suitable for both large-scale and distributed energy generation.

Advancements in SNR technology have led to improved thermal efficiencies and enhanced utilization rates of fuel. Operating at higher temperatures, these reactors enable more efficient conversion of heat into electricity. Additionally, advanced fuel designs, such as high-temperature gas-cooled reactors and molten salt reactors, can be employed in some SNRs, potentially reducing nuclear waste and extending fuel cycle lifetimes, thereby contributing to a more sustainable nuclear energy sector.

Despite their promise, SNRs face challenges that require attention. Regulatory frameworks need adaptation to accommodate SNR deployment while ensuring safety standards. Addressing the costs associated with SNR research, development, and licensing is crucial for their economic viability. Additionally, public perception and acceptance of nuclear energy, including SNRs, significantly influence their widespread adoption.

SNRs offer a broad range of applications beyond traditional electricity generation, including district heating, desalination, and hydrogen production. Their compact size and versatility make them suitable for various industries and settings. Looking ahead-continued research and development efforts, supported by favorable policies and international cooperation, hold the key to unlocking the full potential of SNRs and driving significant advancements in nuclear energy.

### **Conclusion**

Small nuclear reactors have emerged as a promising solution to meet our increasing energy demands while addressing safety, efficiency, and waste reduction concerns. With their enhanced safety features, flexibility, and scalability, SNRs have the potential to revolutionize the nuclear energy landscape. However, overcoming regulatory, economic, and public acceptance challenges is essential for their successful deployment. As we strive for a sustainable future, SNRs can play a vital role in diversifying our energy mix and reducing greenhouse gas emissions, paving the way for a cleaner and more secure energy future.

### **References**

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## **ENHANCEMENT OF PHOTOCATALYTIC ACTIVITIES TOWARD CHEMICAL AND ELECTROCHEMICAL REACTIONS IN AU NANOSTRUCTURES [MINI REVIEW]**

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**Abstract:** This mini report provides an overview of the recent advancements in enhancing the photocatalytic activities of gold (Au) nanostructures for chemical and electrochemical reactions. Au nanostructures have gained significant attention as promising photocatalysts due to their unique

plasmonic properties and high catalytic activity. The report discusses strategies employed to enhance their photocatalytic performance, including size and shape control, surface modification, and hybridization with other materials. The underlying mechanisms and key factors influencing the photocatalytic activities of Au nanostructures are also explored. Furthermore, the report highlights the applications of Au nanostructures in various photocatalytic reactions, such as water splitting, carbon dioxide reduction, and organic pollutant degradation. The findings emphasize the potential of Au nanostructures as efficient photocatalysts and provide insights into recent advances in this field.

**Key words:** Photocatalysis, gold nanostructures, plasmonic properties, catalytic activity, size and shape control, surface modification, hybrid materials, water splitting, carbon dioxide reduction, organic pollutant degradation.

### **Introduction**

The field of photocatalysis has witnessed significant advancements in utilizing light energy for chemical and electrochemical reactions. Gold (Au) nanostructures have emerged as highly promising photocatalysts due to their unique plasmonic properties and excellent catalytic activity. This mini report provides an overview of recent developments in enhancing the photocatalytic activities of Au nanostructures for various reactions [1].

### **Results and discussion**

Numerous strategies have been investigated to enhance the photocatalytic performance of gold (Au) nanostructures. These strategies encompass meticulous control over the size and shape of the nanostructures, implementation of surface modification techniques, and incorporation of other materials through hybridization. These approaches have resulted in notable improvements in catalytic efficiency and selectivity.

The photocatalytic activities of Au nanostructures are governed by several critical factors. Plasmonic effects and localized surface plasmon resonance play a pivotal role in augmenting the absorption of light and facilitating energy transfer processes. The dynamics of charge carriers and transfer mechanisms significantly impact the efficiency of electron-hole separation and subsequent redox reactions. Furthermore, the reactivity of the surface and the presence of catalytic sites exert substantial influence on the overall photocatalytic performance.

Au nanostructures have demonstrated immense potential in various photocatalytic reactions. They have been effectively employed in the process of water splitting to generate hydrogen, which serves as a clean and sustainable energy source. Additionally, Au nanostructures have exhibited promise in the reduction of carbon dioxide, leading to the production of value-added fuels and chemicals. Moreover, they have been utilized in the degradation of organic pollutants, thus contributing to environmental remediation endeavors.

Although Au nanostructures have exhibited remarkable photocatalytic performance, several challenges must be addressed to enable their practical implementation. These challenges encompass considerations of scalability and cost-effectiveness, stability and durability for long-term applications, as well as the rational design and optimization of Au nanostructures. Furthermore, exploring the integration of Au nanostructures with energy storage and conversion systems presents another avenue for broader applications in the field.

### **Conclusion**

The enhancement of photocatalytic activities in Au nanostructures offers exciting prospects for chemical and electrochemical reactions. Through strategies such as size and shape control, surface modification, and hybridization, their catalytic performance can be significantly improved. Understanding the underlying mechanisms and key factors influencing their photocatalytic activities is essential for the rational design of efficient systems. The applications of Au nanostructures in water splitting, carbon dioxide reduction, and organic pollutant degradation demonstrate their potential in addressing important environmental and energy challenges. Further research and development efforts are needed to overcome challenges and unlock the full potential of Au nanostructures for practical photocatalytic applications.

### References

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## **RELATIONSHIP BETWEEN GLOBAL WARMING AND UNEXPECTEDLY HIGH OCEAN TEMPERATURES [MINI-REVIEW]**

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**Abstract:** This mini-review examines the relationship between global warming and the occurrence of unexpectedly high ocean temperatures. As the Earth's climate continues to warm due to human-induced greenhouse gas emissions, the oceans are experiencing significant changes, including rising sea surface temperatures. This article provides an overview of the mechanisms contributing to increased ocean temperatures, such as greenhouse gas absorption, ocean circulation patterns, and heat transfer processes. It also discusses the consequences of elevated ocean temperatures on marine ecosystems, including coral bleaching, altered species distributions, and ecosystem disruptions. By understanding the complex interactions between global warming and ocean temperatures, policymakers and scientists can work towards mitigating and adapting to the impacts of climate change.

**Key words:** global warming, ocean temperatures, climate change, greenhouse gases, marine ecosystems, coral bleaching.

### Introduction

Global warming, primarily driven by human activities, is causing profound changes in the Earth's climate system. One of the most noticeable effects is the rising temperature of the oceans. This mini-review aims to explore the relationship between global warming and unexpectedly high ocean temperatures. The oceans play a critical role in regulating the planet's climate, and alterations in their thermal conditions have far-reaching implications for marine ecosystems and the overall stability of the Earth's climate system.

### Results and discussion

Global warming leads to increased ocean temperatures through various mechanisms. The primary driver is the absorption of greenhouse gases, particularly carbon dioxide (CO<sub>2</sub>), by seawater. As CO<sub>2</sub> levels rise in the atmosphere, more of it is dissolved into the oceans, resulting in a phenomenon known as ocean acidification. This process leads to changes in the thermal properties of seawater, contributing to higher temperatures. Furthermore, changes in ocean circulation patterns, such as the weakening of major currents like the Gulf Stream, can cause localized heating and alter heat transport processes, resulting in pockets of unexpectedly high ocean temperatures[1-2].

The consequences of elevated ocean temperatures are significant for marine ecosystems. One of the most visible effects is coral bleaching, which occurs when corals expel the symbiotic algae living within their tissues due to stress caused by high temperatures. Coral bleaching events have become more frequent and severe, leading to mass coral mortality and the degradation of coral reef ecosystems. Additionally, rising ocean temperatures can cause shifts in species distributions, as certain organisms may struggle to adapt to warmer conditions, while others may benefit. Such shifts can disrupt ecological interactions and alter the structure and functioning of marine ecosystems.

Addressing the relationship between global warming and unexpectedly high ocean temperatures requires a multi-pronged approach. Mitigation efforts aimed at reducing greenhouse gas emissions are crucial to limit further warming and minimize the associated impacts on ocean