Application of superhydrophobic in energy storage

Are superhydrophobic surfaces suitable for energy-related applications?
The superhydrophobic surfaces have potential applications and are worthy further investigations. We provide here a review of the fabrications, characterization and the emerging energy-related applications of superhydrophobic surfaces on the basis of the recent progresses of the research and development in this field.

What are the new applications of superhydrophobicity?
In this paper we will discuss the recent theoretical advances in superhydrophobicity, the relation of superhydrophobicity to the more general type of "superphobic" surfaces, and new potential applications of superphobicity such as new energy technology, green engineering, underwater applications including antifouling, and optical applications.

Can superhydrophobic surfaces improve system performance?
Recent progress on superhydrophobic surfaces is reviewed. The superhydrophobic surfaces are gradually used in the energy-related applications. Application of superhydrophobic surfaces can enhance the system performance. The further research topics are proposed.

Can superhydrophobic features be functionalized on metal surfaces?
If the superhydrophobic features can be functionalized on various metal surfaces,it will be significant and beneficial in many industrial applications for saving energy and energy storage . For example,it can drag reduction,anti-fouling,and enhance heat transfer performance.

What makes superhydrophobic surfaces unique?
The uniqueness of superhydrophobic surfaces arises from various phenomenal advances,and its progress is expected to continue for decades in the future. In this Review Article,we discuss recent progress made in defining physical aspects of numerical modeling,experimental practices adopted,and applications of superhydrophobic surfaces.

Can superhydrophobic surfaces be used as heat transfer surfaces?
Therefore,it is necessary to investigate the boiling heat transfer on superhydrophobic surfaces. The hydrophobic (PTFE) and superhydrophobic (SWR (super-water-repellent)) surfaces were used as heat transfer surfacesin the pool boiling experiments .

artificial superhydrophobic surfaces could be prepared. Imagine, if you could impart superhydrophobic prop-erties on a specific material, you could get artificial superhydrophobic surfaces for a variety of applica-tions, for example, superdry surfaces, antifogging mirrors and displays, self-cleaning window and panels,

Shape memory alloys (SMA) treated by laser cladding (LC) offer the benefits of a controlled heat-affected

zone and strong metallurgical bonding between the coating and ...

Currently, there are two main concepts used in developing self-cleaning surfaces [6].The first concept (physical self-cleaning) is based on the superhydrophobic approach where water droplets attain the spherical shape and then they roll off the surface carrying away the dirt particles [7].For physical self-cleaning, the surface roughness and low surface energy of ...

Superhydrophobic coatings have been intensively explored for their great potential applications in numerous fields such as anti-icing/deicing [1], water harvesting [2], oil-water separation [3], self-cleaning [4], [5], [6], and corrosion protection [7], [8], all of which have been accelerated in recent decades by discoveries of various superhydrophobic phenomena in ...

Inspired by the superhydrophobic properties of some plants and animals with special structures, such as self-cleaning, water repellent, and drag reduction, the research on the basic theory and practical applications of superhydrophobic ...

In view of a smart combination of thermal energy-storage function and superhydrophobic feature, the microencapsulated PCM developed by this study are expected ...

In this paper we will discuss the recent theoretical advances in superhydrophobicity, the relation of superhydrophobicity to the more general type of "superphobic" surfaces, and ...

The mechanisms of drag reduction on superhydrophobic surfaces and the effects of parameters such as flow rate, fluid viscosity, wettability, and surface morphology on drag reduction are discussed ...

5 Conclusions and outlook. We reviewed the main research progress on superhydrophobic SMPs in recent years, focusing on their preparation technologies, activation methods, and application fields. Superhydrophobic SMPs are a novel class of functional materials, and their unique memory properties can be harnessed to control the hydrophobicity and adhesion of the material surface.

Active method is mainly through external energy de-icing. There are many such methods and here is a simple introduction of several. For example, the principle of electric heating anti-icing is through applying an electric current by the electric heating element, melting the ice, and reducing the binding force between the ice and the surface (Ibrahim et al., 2019; Pan et ...

However, the effective application of PDRC materials is frequently constrained by performance deterioration caused by surface contamination in real-world environments. In this study, we ...

Applications of superhydrophobic surfaces. (a) Scheme illustration of all-natural superhydrophobic surface applied for biomedical devices, (b) ... such as energy transfer and storage, precision solder-drop dispersions in

microelectronics, or deposition of pesticides on leaves [58]. Xiong et al. described a wearable all-fabric-based ...

Furthermore, the study demonstrated practical applications of this technology, including its incorporation into architectural models and transparent superhydrophobic ...

Subsequently, measures to improve the anti-icing/deicing performance of the P@SHBM were summarized emphatically, including enhanced superhydrophobic and photothermal conversion performance, reduced heat loss, energy storage/release, and all-weather anti-icing applications.

This jumping motion on the super-hydrophobic surface is created by gradient surface energy that exists between the coalesced water droplets and the superhydrophobic surface [31]. This jumping condensate mechanism is found in all the naturally occurring super-hydrophobic surfaces and therefore, the bio-mimicked surface will also possess the same ...

Superhydrophobic materials maintain air at the solid-liquid interface when in contact with water. These surfaces possess high apparent contact angles, by definition exceeding 150°, as a result of the composite solid-air surface formed under a water droplet (Fig. 1 a).An additional stipulation sometimes included in the superhydrophobic definition, depending on the ...

Abstract Multifunctional phase change materials-based thermal energy storage technology is an important way to save energy by capturing huge amounts of thermal energy during solar irradiation and releasing it when needed. Herein, superhydrophobic thermal energy storage coating is realized by spraying mesoporous superhydrophobic C@SiO2-HDTMS ...

Many diverse applications have been found in the fields, such as space and aerospace, defence, automotive, biomedical applications and engineering, sensors, apparels, and so on. Superhydrophobic surfaces repel ...

The mechanisms of drag reduction on superhydrophobic surfaces and the effects of parameters such as flow rate, fluid viscosity, wettability, and surface morphology on drag reduction are ...

Herein, we successfully prepared a fully biomass-based ss-PCM, superhydrophobic thermal energy storage (STES) coating by employing beeswax (BW) as phase change materials (PCMs) and DFs as supporting materials via ...

Due to the extremely low surface energy and unique structural properties, superhydrophobic surfaces exhibit exceptional water repellent, self-cleaning, anti-adhesion properties. These characteristics have led to their widespread application across various fields such as textiles, construction, and healthcare with notable success.

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The smart attributes refer to some properties which could change in different situations including conductive SHSs, SHSs for energy storage, photocatalytic SHSs, self-healing SHSs, stimuli-responsive properties SHSs, and switchable superhydrophilic-superhydrophobic surfaces [18]. These properties (function) respond to external stimuli.

The growing demand for sustainable energy storage solutions has underscored the importance of phase change materials (PCMs) for thermal energy management. However, traditional PCMs are always inherently ...

Superhydrophobic materials, known for their exceptional water-repellent properties, have found widespread applications in diverse fields such as self-cleaning surfaces, anti-icing coatings, and water-resistant textiles. In recent ...

Through meticulous examination and mimetic replication of distinctive structures found in various natural organisms, engineers have achieved the development of superhydrophobic materials that reflect their specific functionalities, thereby presenting novel solutions to challenges across a spectrum of energy and industrial application domains.

Herein, superhydrophobic thermal energy storage coating is realized by spraying mesoporous superhydrophobic C@SiO 2-HDTMS nanotubes (NTs), industrial paraffin wax ...

A convenient approach to reduce food waste is via smart packaging (Goddard & Herskovitz, 2020).Food packaging conventionally has been used as a physical barrier to protect and preserve key qualities of food in the farm-to-fork processes (Brody et al., 2008, Cataldi et al., 2019, Duncan, 2011, Mustafa and Andreescu, 2020).Smart packaging, on the other hand, ...

Functional coatings that can achieve stable superhydrophobicity have the potential to significantly enhance a plethora of industrial applications ranging from building environmental control, phase change heat transfer, ...

In this Review Article, we discuss recent progress made in defining physical aspects of numerical modeling, experimental practices adopted, and ...

7 Applications Superhydrophobic materials are widely covered in detail in the scientific literature for their many proposed application areas, primarily in non-submerged environments. ... which are significant for many applications, ...

Introducing the capability of self-healing to superhydrophobic materials is an effective strategy for improving their durability. This study examined self-healing superhydrophobic coatings based on diatom frustules and paraffin wax, and systematically compared coatings based on diatom frustules with those prepared by using diatomite and ...

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Reducing energy consumption by coating technology is of major interest in recent decades [[1], [2], [3]].The drag force exerted on ships and submarines can result in increasing the fuel consumption, increasing the CO 2 emissions and subsequently, can contribute to global warming. Superhydrophobic surfaces, which possess unique characteristics, can considerably ...

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