

What are polyurethane polymers?

Polyurethane polymers (PUs) have been synthesized as solid-solid phase change materials for thermal energy storage using three different kinds of diisocyanate molecules and polyethylene glycols (PEGs) at three different molecular weights.

Does PEG-based polyurethane reversibly absorb thermal energy during a form-stable phase transition?

Furan-modified particles served as cross-linkers as well as photo-thermal fillers. In this study, PEG-based polyurethane PCM reversibly absorbed and stored thermal energy associated with a form-stable phase transition.

Can polyurethane grafted reduced graphene oxide be used for solar energy conversion?

Fabrication and characterization of polyurethane-grafted reduced graphene oxide as solid-solid phase change materials for solar energy conversion and storage. Polyurethane-based solid-solid phase change materials with halloysite nanotubes-hybrid graphene aerogels for efficient light- and electro-thermal conversion and storage. Sol. Energy Mater.

Are polyurethanes useful in TES materials?

Among the various polymers used for the production of TES materials, the potential utility of polyurethanes (PUs) has been recognized due to their numerous mirthful properties (e.g., facile processability, high anti corrosiveness, strong mechanical performance, and chemical resistivity) [16,17].

Are cross-linked polyurethane PCM composites suitable for solar-to-thermal energy storage?

Such cross-linked polyurethane PCM composites exhibited excellent self-healing properties under NIR irradiation. Due to their outstanding recyclability, interesting energy storage ability and form stability, they have enormous potential for applications in the fields of solar-to-thermal energy conversion and storage.

1. Introduction

Can Peg-based polyurethane PCM convert solar energy into heat energy?

In this study, PEG-based polyurethane PCM reversibly absorbed and stored thermal energy associated with a form-stable phase transition. Furthermore, f-PDAPs were used as photo-thermal fillers and cross-linking points in a PEG-based polyurethane PCM to convert solar energy into heat energy.

Department of Industrial Engineering and INSTM Research Unit, University of Trento, Trento, Italy; In this work innovative thermal energy storage materials were developed by encapsulating a paraffin having a melting temperature of 6°C (M6D) in a thermoplastic polyurethane (TPU), and the most important physical properties of the resulting samples were investigated from a ...

This paper aims to provide a flexible polyurethane (PU) film with visible light trapping ability, photothermal

conversion and energy storage performance by covalently bonded a visible light absorbing dye into the polymer through copolymerization. For this target solution copolymerization of diphenyl-methane-diisocyanate (MDI), poly(1,4-butylene ...

Thus, the polyurethane-based solid polymer electrolyte (PUSPE) with a shape-memory performance is designed and prepared, possibly controlling the temporary shape and restoring the original shape with the help of the polycaprolactone (PCL) soft segments. ... In general, this work provides the possibility for flexible energy storage device with ...

Polymer-based composites filled with ceramic particles such as barium titanate (BT) or lead zirconate titanate (Pb (Zr,Ti)O₃) are considered as ideal materials for energy storage capacitors in ...

Hyperbranched polyurethane possesses the feature of being less prone to crystallization due to its highly branched structure, which is beneficial to ion transport [31]. ... *Energy Storage Mater.*, 49 (2022), pp. 502-508, 10.1016/j.ensm.2022.04.015. View PDF View article View in Scopus Google Scholar [27]

Energy Storage is a new journal for innovative energy storage research, ... (PCMs), comprising of the thermoset polymer matrix (polyurethane, PU) enclosing capric acid (CA) as an active thermal energy storage (TES) component. The Fourier Transform Infrared Spectroscopy (FTIR) and Field-Emission Scanning Electron Microscopy (FE-SEM) have been ...

Phase change materials with high energy storage density and stable phase change temperature are ideal choices for personal thermal therapy and heat management. However, leakage and poor flexibility have long been bottlenecks in their application. Excellent latent heat performance and flexibility are crucial, especially in the thermal management of ...

Polyurethane (PU) foam is most commonly used in thermal insulation in cold storage applications whereas it lacks thermal energy storage characteristics. In the present work, a phase-changing material n-pentadecane is microencapsulated with poly (methyl methacrylate-co-methacrylic acid) using oil in water (O/W) emulsion polymerization followed by the ...

Solar energy is regarded as one of the most promising sources of sustainable and renewable energy because it is plentiful, pollution-free and clean [1], [2], [3]. However, its large-scale application is limited by the intermittency and inefficiency of solar radiation [4], [5], [6]. Therefore, an efficient energy storage system is urgently needed to store daytime solar ...

Abstract. A series of polyurethane phase change materials (PUPCMs) with different structures were successfully synthesized using polyethylene glycol (PEG), polycarbonate (PCDL), or ...

Form-stable composite phase change materials exhibit considerable application prospects in the insulation of submarine oil and gas pipelines due to their good chemical stabilities, levels of thermal insulation, and leakage

resistances. In this study, composite phase change materials (PU-MPCM) were prepared for application in submarine oil and gas ...

DOI: 10.1021/ACS.IECR.7B03330 Corpus ID: 103257878; Thermal Energy Storage Using Poly(ethylene glycol) Incorporated Hyperbranched Polyurethane as Solid-Solid Phase Change Material

Thermal energy storage technique is becoming an indispensable approach for enhancing the efficiency of thermal energy conversion and utilization by employing the polymeric phase change composite ...

Reducing the impact of energy related processes on global climate is a core area of interest to sustain life on earth. Among possible replacement to fossil fuels based energy, the renewable methods have gotten tremendous attention owing to overall environment-friendly processes, renewability and large sums of energy reserves [1], [2]. Among all renewable ...

DOI: 10.1016/J.SOLENER.2012.03.012 Corpus ID: 93327951; Polyurethanes as solid-solid phase change materials for thermal energy storage @article{Alkan2012PolyurethanesAS, title={Polyurethanes as solid-solid phase change materials for thermal energy storage}, author={Cemil Alkan and Eva G{&u}nther and Stefan Hiebler and {&O}mer Ensari and Derya ...

1. Introduction. Since the 21st century, climate change caused by the greenhouse effect has serious implications for humanity's future survival. Naturally, energy shortages and environmental pollution had received widespread attention and global carbon neutrality and carbon peaking proposed [1, 2]. Therefore, how to store and use energy ...

Excellent interfacial compatibility of phase change capsules/polyurethane foam with enhanced mechanical and thermal insulation properties for thermal energy storage. Author ... The fabrication of novel phase change energy storage (PES) functional composite material by combining PUFs with PCMs will improve thermal insulation efficiency and open ...

In addition, our group [21] have already synthesized PEG-based polyurethane solar energy storage SSPCMs using a simple one-step solvent-free method, which showed good thermal stability. However, its low solar-to-thermal conversion efficiency and poor mechanical strength are unsatisfactory. Therefore, it is vigorous to improve energy storage ...

The major aim of the present study is to improve the thermal characteristics of polyurethane foams (PUFs) that have been almost exclusively used for thermal insulation purposes but can also play a role in potential thermal energy storage components as a matrix material.. To overcome the low thermal conductivity of the of PUFs matrix, a synthesized ...

At present, the shortage of energy resources has become a universal problem. Regarded as the most effective way of utilizing traditional energy [1,2,3,4,5,6], the thermal energy storage technology can be categorized into

sensible heat storage, latent heat storage, and chemical reaction heat storage [].Among them, the latent heat storage based on the phase ...

The current research is oriented towards the development and assessment of the properties of the form-stable phase change materials (PCMs), comprising of the thermoset ...

ORIGINAL RESEARCH published: 26 September 2018 doi: 10.3389/fmats.2018.00058 Thermoplastic Polyurethane Blends With Thermal Energy Storage/Release Capability Andrea Dorigato*, Daniele Rigotti and Alessandro Pegoretti Department of Industrial Engineering and INSTM Research Unit, University of Trento, Trento, Italy Edited by: Alfonso Maffezzoli, ...

In this work, polyurethane (PU) insulating panels containing different amounts of a microencapsulated paraffin with a nominal melting temperature of 24 °C, used as phase change material (PCM), were produced. The resulting panels behaved as multifunctional materials able to thermally insulate and simultaneously storing/releasing thermal energy near room ...

Keywords Photothermal conversion polyurethane · Energy storage · Near-infrared absorption Introduction Infrared light from the sun accounts for 49% of the heating of the earth, so infrared radiation is also known as "heat radiation". The shorter "near-infrared" waves, which are

Usage of thermo-regulative phase change material (PCM) doped polyurethane (PU) foam (PU-PCM) as a building component in cold storage can promote electricity saving in terms of cooling load reduction through utilizing its mutual advantage of insulation as well as thermal energy storage property of PU & PCM respectively.

Solid-solid phase change materials (SSPCMs) with low volume change, no leakage, lack of corrosion and extensive service lives are used more and more widely in the application field of thermal energy storage (TES). In this study, eco-friendly polylactic acid (PLA)/polyurethane (PU) phase change composites with good recyclability and excellent form ...

Moreover, PCM microcapsules still have other potential applications such as solar-to-thermal energy storage, electrical-to-thermal energy storage, and biomedicine . Zhang et al. studied solar-driven PCM microcapsules with efficient Ti ...

Taking the joint advantages of the thermal insulation capacity of polyurethane foams (PU) and the thermal energy storage capacity of phase change materials (PCMs), it is possible to produce PU ...

Polyurethane (PU) foam composites with improved thermal energy storage capability were fabricated based on microencapsulated phase change materials (microPCMs) with a poly (methyl methacrylate) (PMMA) shell and a n-octadecane core.Styrene and maleic anhydride (SMA) copolymers were the most efficient emulsifier because they resulted in the ...

In this work innovative thermal energy storage materials were developed by encapsulating a paraffin having a melting temperature of 6°C (M6D) in a thermoplastic polyurethane (TPU), and the most ...

Polyurethane (PU) foam composites with improved thermal energy storage capability were fabricated. Composites were designed based on PU and microencapsulated phase change materials (microPCMs ...

Thermal energy storage (TES) materials are innovative systems able to store thermal energy through the heating of a medium, with the aim to utilize (release) the stored energy when...

Using polyurethane foams integrated with phase change materials (PCMs) that take cooperative advantages of heat insulation and heat storage capacity can meet the demand for thermal comfort and energy conservation purpose in the buildings. One-shot synthesis method, a cost-effective method, was used in this study for fabrication of PU-PCM composite ...

Application of PCMs as latent heat thermal storage systems includes, maintenance of building's cooling and heating needs during off-peak hours, textiles for relief from hot and cold conditions, shipping containers and food products that require maintaining the desired temperature for longer periods, refrigerators and freezers that uses high energy etc. ...

It is a functional polyurethane with good energy storage effect, and the heat storage mechanism of PUPCM is the transfer between crystalline and amorphous states of the soft segment PEG of PUPCM ...

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