

# HOLLOW ENERGY STORAGE CONCRETE BALL



Concrete with macro-encapsulated octadecane-HSB was capable of reducing the peak indoor air temperature and the fluctuation of indoor temperature and can be very effective in transferring the heating and cooling loads away from the peak demand times. The application of thermal energy storage with phase change materials (PCMs) for energy efficiency of buildings grew rapidly in ???



This paper reports the use of PCMs with a phase change temperature of 25 ??? encapsulated in hollow HDPE balls with inner diameter of 24 mm and outer diameter of 25 mm. Lihui LIU, Jie LI, Xiaoqin SUN. Study on heat transfer of phase change materials imbedded in a concrete wall[J]. Energy Storage Science and Technology, 2021, 10(1): 287-294



Concrete is an important and versatile building material in every area of construction worldwide. The large thermal mass of normal-weight aggregate concrete (NWAC) buildings can be advantageous, especially in moderate climates where it can be used to store energy during the day and release it during the night, thus reducing the requirement for ???



It is believed that a hollow steel ball (HSB) can be served as coarse aggregate and the steel has excellent thermal conductivity compared with organic materials and cement based materials. ???



The thermal energy storage system is divided into active and passive systems [6]. The active one is characterized by forced heat exchange accompanied by fans or pumps, which stores thermal energy in the medium through a heat exchanger [7]. A passive thermal storage system effectively utilizes ambient thermal energy, absorbs and releases heat, to ???

# HOLLOW ENERGY STORAGE CONCRETE BALL



, (HSB) PCM , PCM-HSB ??? . (PCM-HSB) (c) ???



@article{Bu2021LowHE, title={Low hydration exothermic well cement system: The application of energy storage microspheres prepared by high-strength hollow microspheres carrying phase change materials}, author={Yuhuan Bu and Rui Ma and Huajie Liu and Chuanhua Ma and Xuezhao Zhao}, journal={Cement & Concrete Composites}, year={2021}, volume={117}



1. Introduction. Concrete is an important and versatile building material in every area of construction worldwide. The large thermal mass of normal-weight aggregate concrete (NWAC) buildings can be advantageous, especially in moderate climates where it can be used to store energy during the day and release it during the night, thus reducing the requirement for ???



19) Zhijun Dong, Hongzhi Cui, Waiching Tang, et al. Development of Hollow Steel Ball Macro-Encapsulated PCM for Thermal Energy Storage Concrete, Materials, Vol. 9, 1, 2016. 20) Wei Liu, Hongzhi Cui, Zhijun Dong, Feng Xing, Haochuang Zhang, Tommy Y Lo; Carbonation of concrete made with dredged marine sand and its effect on chloride binding



Phase change materials (PCMs) have great potential for applications in energy efficient buildings. In this study, an innovative method of macro-encapsulation of PCM using hollow steel balls (HSB) was developed and the thermal and mechanical performance of PCM-HSB concrete was examined. The macro-encapsulation system (PCM-HSB) was attached with a metal clamp (c) ???

# HOLLOW ENERGY STORAGE CONCRETE BALL



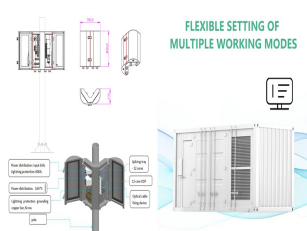
DOI: 10.1016/J.APENERGY.2016.10.072 Corpus ID: 113527439;  
Development of structural-functional integrated energy storage concrete with innovative macro-encapsulated PCM by hollow steel ball



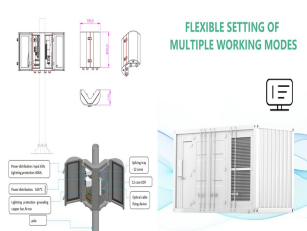
SSSCPCM was then integrated in concrete in varying percentage to form Thermal Energy Storage Concrete slab namely TES-C0, TES-C1, TES-C2, TES-C3, and TES-C4. These slabs were then tested in real



upper part of steel balls, and then the balls were filled with cement slurry. After the cement slurry had dried slightly, the total mass of the hollow steel ball and the cement slurry was weighed to obtain a density of 2439 kg/m<sup>3</sup> for the grouting steel ball. 2.3. Preparation of Concrete Mixed with Phase Change Steel Balls



Development of structural-functional integrated energy storage concrete with innovative macro-encapsulated PCM by hollow steel ball. mechanical properties and numerical simulation of macro encapsulated thermal energy storage concrete. H Cui, SA Memon, R Liu. Energy and buildings 96, 162-174, 2015. 148: 2015: Strength analysis of bamboo by



The development of structural-functional integrated energy storage concrete with innovative macro-encapsulated PCM by hollow steel ball involves incorporating phase change materials (PCMs) into concrete structures to improve their energy storage capabilities. This is achieved by using hollow steel balls as macro-encapsulation agents for the ???

# HOLLOW ENERGY STORAGE CONCRETE BALL



An energy storage microsphere, prepared by encapsulating phase change materials in high-strength hollow microsphere, was proposed in this paper. The research objective was designed to utilise energy storage microspheres (ESM) in the cement mixture to achieve low hydration exothermic, without negatively affecting other properties. In this study, ESM were ???



Energy piles are a new renewable energy technology that is suitable for use as a heat exchanger in ground source heat pump systems. In this study, hollow steel balls macro-encapsulated phase change materials (PCMs) were used for the development of concrete pile, the resulting pile is referred to as the "PCM energy pile." A laboratory-scale PCM energy pile in ???



In 2011, the physics Prof. Dr Horst Schmidt-Böcking [] (Goethe University Frankfurt) and Dr. Gerhard Luther (Saarland University) had the idea of a pump storage system that would be placed on the sea bed. This system would use the high water pressure at great water depths to store energy in hollow bodies. Shortly, after their idea was published on 1 April 2011 in the ???



Development of structural-functional integrated energy storage concrete with innovative macro-encapsulated PCM by hollow steel ball[J] Appl. Energy, 185 ( 2017 ), pp. 107 - 118 View PDF View article View in Scopus Google Scholar



Meeting the majority of energy need in buildings from conventional energy sources brings up problem of global warming as a result of carbon emissions [1]. Enhancing energy efficiency of structures with thermal energy storage is one way to reduce this issue [2]. Therefore, several researchers have concentrated on employing phase change materials to ???

# HOLLOW ENERGY STORAGE CONCRETE BALL



The purpose of this work is to utilise paraffin/alumina hollow spheres and slag to develop a novel thermal energy storage composite (TESC) with an FSPCM mass fraction of up to 80% and latent heat of up to 19.18 J/g, which are all greater than those in ???

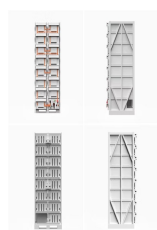


The results showed that the total energy storage capacity of the hardened cement specimens with MPCM increased by up to 3.9-times compared with that of the control cement paste, and the ???

APPLICATION SCENARIOS



Phase change materials (PCMs) have great potential for applications in energy efficient buildings. In this study, an innovative method of macro-encapsulation of PCM using hollow steel balls (HSB) was developed and the thermal and mechanical performance of ???



The application of thermal energy storage with phase change materials (PCMs) for energy efficiency of buildings grew rapidly in the last few years. Development of Hollow Steel Ball Macro-Encapsulated PCM for Thermal Energy Storage Concrete Materials (Basel). 2016 Jan 19;9(1):59. doi



In 2015, Ji et al. [4] used hollow steel balls with high thermal conductivity and high absorption rate as carrier materials to absorb the octadecane, and combined them with concrete materials to prepare a new type of phase change energy storage concrete.

# HOLLOW ENERGY STORAGE CONCRETE BALL



The application of thermal energy storage with phase change materials (PCMs) for energy efficiency of buildings grew rapidly in the last few years. In this research, octadecane paraffin was served as a PCM, and a structural concrete with the function of indoor temperature control was developed by using a macro-encapsulated PCM hollow steel ball (HSB).



Development of structural-functional integrated energy storage concrete with innovative macro-encapsulated PCM by hollow steel ball. Appl. Energy (2017) A. D'Alessandro et al. Multifunctional smart concretes with novel phase change materials: mechanical and thermo-energy investigation.



Development of structural-functional integrated energy storage concrete with innovative macro-encapsulated PCM by hollow steel ball H. Cui Waiching Tang Qinghua Qin F. Xing Wenyu Liao Haibo Wen Engineering, Environmental Science



Memon [15,17] developed thermal energy storage concrete by incorporating PCM in porous lightweight aggregates (LWAs). Thermal energy storage aggregates were prepared with a vacuum impregnation technique. It was found that porous aggregates and PCM are chemically compatible and have large thermal energy storage density.



DOI: 10.1016/J.APENERGY.2015.03.137 Corpus ID: 109486066;  
Development of structural-functional integrated concrete with macro-encapsulated PCM for thermal energy storage  
@article{Memon2015DevelopmentOS, title={Development of structural-functional integrated concrete with macro-encapsulated PCM for thermal energy storage}, ???

# HOLLOW ENERGY STORAGE CONCRETE BALL



? 1/4 ?pcm? 1/4 ?????, (hsb) pcm , pcm-hsb ???

