

STUDY ON PHASE CHANGING MATERIALS APPLICATION IN BUILDING

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ABSTRACT

This paper is on the previous research on the phase change material and phase change material application in building. The phase change material are best material for storage of heat in building. By the property of heat storage it gives cooling and heating effect to the building. Phase change materials have many of types and their application. Phase change materials do not change their own physical-thermal etc. properties with the time and many no of cycle on cooling heating properties. In this paper we study different application and it's properties.

Keywords:passive storage system, active storage system, application of pcm

I. INTRODUCTION

Development of world are increasing rapidly, therefor the need of energy are increasing. And demand of comfort also increasing and therefor energy consumption increasing.

Therefor, used of phase change materials in building are best solution for need of energy consumption because in all over the consumption of energy building consume near about 20%-40% both in residential and commercial building. Phase change materials required less amount of investment. Phase change materials maintain the thermal temperature in the building it gives the cooling and heating effect. By this application which produced harmful gases, and many kinds of pollution are reduced. Phase change materials are 'latent' thermal storage materials possessing a large amount of heat energy stored during its phase change stage. The energy required to change the phase of a substance is know as latent heat. In this project we are using phase change materials for thermal energy storage application, and much attention has been given to work concerned with the achievement and assessment of applying pcm in concrete wall. Because

concrete have high specific heat capacity as well as the thermal conductivity which will eventually affect their thermal performance.

II. LITERATURE REVIEWS

2.1 vineet Veer Tyagi, D. Buddhi "PCM thermal storage in buildings: A state of art"(2005) This paper is based on the phase change materials and their application in that they explain the passive storage system and active storage system. We study about various types of phase change materials and their properties and used into various type. By using phase change material how decreased the pollution in the environment. Phase change material future scope used are study in this paper. Mainly it's study about heating and cooling effects of phase change materials application.

2.2 Luis Pe'rez-Lombard, Jose'Ortiz, Christine Pout "A review on buildings energy consumption information"(2007)how the phase change material reduced the global warming effect are study in this paper. The demand are increasing daily based in that about the 20%-40% energy used in the resident and commercial building. There are many kind of pollution will also increase daily therefor, the HVAC systems energy are used. In that paper HVAC system used it's daily consumption of energy for the building. All the question which have about the information of HVAC system are solved in this paper.

2.3 Fan Tie-lin, Zhao Feng-qing "Application of Phase Change Materials in Buildings"(2014) this paper is about the application of phase change materials used in building their used. All the details about the gypsum board, mortar and concrete.the pollution increased their for natural resource demand also increased. phase change material incorporation with the building materials are explain in this paper. Phase change materials application merits and demerits are explain

in this paper. Classification of materials on the based of transit from and component are explain.

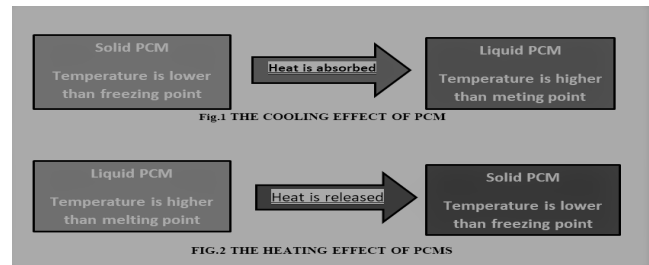
2.4 V.V. Tygi, S.C. Kaushik, S.K. Tyagi, T. Akiyama, “Development Of Phase Change Materials Based On Microencapsulation Building: A Review”(2011) microencapsulation method are detailed explain in this paper. Microencapsulation method is used for the incorporation of phase change materials with the building materials and formed the building material. In this paper explain how the microencapsulation are best for decreasing energy consumption demand. How it help to maintain the temperature in the building and gives the cooling heating effect into the building. Microencapsulation not only used in the building construction but it also used in chemical, food, medical etc. many of industry.

2.4 R. Parameshwaran, S. Kalaiselvam, S. Harikrishnan, A. Elayaperumal“Sustainable thermal energy storage technologies for buildings: A review”(2012)to reduced green house effect international level also study. This is most important to reduced its effect, many of problems about climat are occurs and disses also many of problems increased. this paper explain the important of thermals storage energy application in building because all over the energy consumption building used near about 40% their for its important to study and apply the thermal storage application in building..

IV. PHASE CHANGE MATERIAL

Phase change materials are the materials which gives the effect of cooling and heating to the building. Phase change materials are changes its state with change in temperature. when the temperature is high phase change materials change it's state from solid to liquid and gives the cooling effect into the building and reversely when the temperature is loss means decreased phase change materials change it's state from liquid to solid and gives the heating effect into the building. Phase change materials gives the revers thermal effect into the building with the atmospheric temperature. therefor, the phase change materials are decreased the energy consumption used for giving the cooling and heating effect application. Phase change materials only used the natural sun only for thermal recycling. And phase change materials do not change it's properties by many of time cycle. Phase change materials are have many of type and it also classified with their state from, component. In the classification of component there are 3type organic compound, inorganic compound and organic-inorganic compound. All the compound have their properties all have the merit and demerits. By this properties and merit and demerits there use and application are different incorporation with the building materials. Direct mixing method. Immersion method, capsulation method are 3type for the incorporation of building materials and phase change materials. In that capsulation is of best and most commonly

used method. In the capsulation method thir are 2type microencapsulation and macro-capsulation. Macro-encapsulation are not because its required large container and many of its drawback. Therefor for in the incorporation microencapsulation are used. Microencapsulation have many of good properties it's cost is less it required small space etc. and their for it used in most of the application. Phase change materials have very high latent heat storage capacity. Phase change materials are have high stability over long period of time .phase change materials are used not only in construction of building it also used in the food industry, pharma industry etc.



MICROENCAPSULATION

In the process of microencapsulation tiny solid particle or droplets of liquid are surrounded or coated with a continuous film of polymeric materials to produce capsule around the particle of solid or liquid droplet in micrometer to millimeter rangeand the final product is produced this process is called as microencapsulation. Microencapsulation it also defined in processes one particle of solid or droplet of liquid are enveloped or surrounded within one solid or droplet substance to other in micron to millimeter. Particle size is rang in 50-500 micron. It's have two phase core materials and coating materials. There are chemical and physical method for manufacture of capsule. In the chemical method matrix polymerization, interfacial polymerization, in situ polymerization .and in the physical method centrifugal extrusion, vibrational nozzle, air-suspension coating, spray drying and pan coating method.

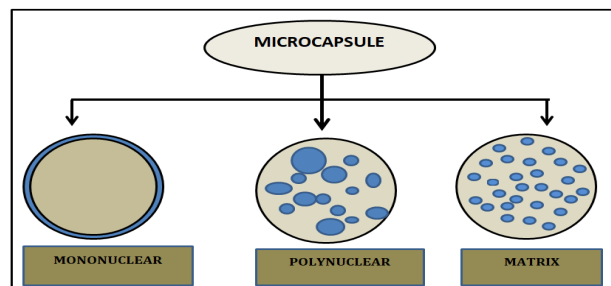


FIG.3 TYPE OF MICROCAPSULE

APPLICATION

There are many kind of application of phase change materials. Phase change materials application used many industry like textiles, transportation, bedding, medical, construction materials, catering, electronics, green building, temperature peak stabilization, air-conditioning, etc. in that paper study about the application in construction building . it'sdivided into two storage system passive and active storage system. In passive storage system include PCM trombe wall, PCM wallboard, PCM shutter, PCM building blocks, air-based heating system, floor heating, ceiling boards. And in the active storage system floor heating, ceiling board, etc.

Passive storage system

- A passive storage system is a way for the building materials to collect, store, and distribute solar energy by natural convection, conduction, and radiation.
- The building itself acts as thermal mass to store the heat it collects during the day which is then released during the night.
- A passive heating system depends on the combination of architecture and building materials.
- Passive storage system happens when sunlight strikes an objective and that objective absorbed the heat.
- Passive storage system will effectively works when the windows are oriented correctly, perfect orientation is south.
- By installing high performance windows with insulated frames, multiple glazing, low e-coating, may reduced the heat loss by 50 to70%.
- **Advantages**
- Passive storage system design is highly energy efficient, reducing a building's energy demands for lighting, winter heating, and summer cooling.
- Energy from the sun is free.
- Passive storage system design also helps conserve valuable fossil fuel resources so that they can be directed towards other uses. And it save money.
- Day lighting a component of many passive storage system design, is one of the most cost-effective means of reducing energy usage in building.
- Passive solar design also reduced greenhouse gases that contribute to global warming because it relies on solar energy, a renewable, non-polluting resource.
- Energy performance: lower energy bills all year-round.
- Attractive living environment: large windows and views, sunny interiors, open floor plans.
- Comfort: quiet (no operating noise), solid construction, warmer in winter, cooler in summer (even during a power failure)

Active Storage System

- In active solar energy the system uses mechanical equipment such as pumps and blower and other type of equipment to collect, store and covert solar energy also use when solar energy is not enough.
- In this type of energy once the energy from the sun is absorb, it is stored for later use.
- Active solar techniques increases the supply of energy
- Cadmium is used in cadmium telluride solar cells as a semiconductor to convert solar cells energy into electricity.
- Through used in very small amounts, it is extremely toxic and can build up in a given ecosystem if it isn't monitored.
- Modern solar system use components that radiate high levels of radio frequency electromagnetic radiation, which poses health risks to those with electromagnetic hypersensitivity (EHS).
- Some of the symptoms of this health risk are common and non-specific, such as headaches and restlessness.
- Space requirement- active storage systems rely on the sun to heat liquid. Weather the liquid is water or an antifreeze mixture. To generate enough hot liquid to be useful, a large space is required.
- **Advantage**
- It is very effective in colder climates, when interior heating is necessary during most of the year.
- Free sunlight can save thousand of dollars ayears in utility bills in area with long winters.
- Generally, maintenance with solar heating system will involve keeping the solar panel clean and unobstructed from snow, bird dropping, tree branches and other debris.
- On average solar heating system require a mere 8 to 16 hours of routine maintenance per year.
- It is also worth nothing that many grid- tie solar heating systems come with warranties at least 10 years.

VI. CONCLUSION

This paper is about the study of phase change materials and their application from the previous research paper. By study of paper we conclude that to complete the needs of comfort for future natural resources are not sufficient for this the phase change materials is best option. By the used of phase change materials in construction building thermal changes in building with the environment temperature is can be maintained. In this paper we study about the phase change materials have many of type and they classified by it's compound and state from. And also study about the incorporation of building with the phase change material.

Microencapsulation is best method for incorporation of building with the phase change material. Phase change materials have many of application in building and it divided into two type passive storage system and active storage system. Passive storage system are cheaper external equipment. Passive storage requires no maintenance cost. And it is efficiency depends on the weather. Passive storage system use a phenomenon that happens naturally. No moving parts. Less control in gathering and distribution of energy. And in the active storage system use external sources of energy or uses conventional energy sources to operate. It requires expensive equipment, lot of maintenance. Its efficiency depends on the type of equipment used. Its typically work on mechanical system. Lots of moving part in that. It allows controlled and efficient gathering and distribution energy.

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