

Heat Storage & Solar Refrigeration

Steelhead Specialty Minerals zeolites are naturally occurring earth minerals. Their high heat of adsorption and ability to hydrate and dehydrate while maintaining structural stability have been found to be useful in various heat storage and solar refrigeration systems. This hygroscopic property coupled with an inherent exothermic reaction when taken from a dehydrated to a hydrated form (heat of adsorption), makes natural zeolites effective in the storage of solar and waste heat energy.

Low energy density and time of availability have been key problems in the use of solar and waste heat energy. Commercial storage systems have been developed incorporating Steelhead Specialty Minerals zeolites which overcome these problems.

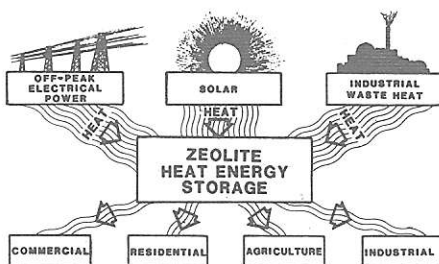


Figure 1 demonstrates the use of Steelhead Specialty Minerals zeolites as heat storage media.

These systems are capable of operating from solar, industrial waste heat and other thermal pollutants, thereby converting underutilized resources into useful energy.

The capacity of natural zeolites to store heat energy and adsorb water vapor used in that exchange of energy comes from their honeycomb structure and resultant high internal surface area.

When "charged" with heat, Steelhead Specialty Minerals zeolites can store latent heat energy indefinitely if maintained in a controlled environment and not exposed to water vapor. This stored energy can be liberated as needed by simple addition of controlled amounts of water vapor which initiates the exothermic reaction. Most other storage media lack this basic property.

Heat storage units using natural zeolites reduce dependence on secondary/backup heating systems and allow for efficient and safe use of waste heat.

The principle of adsorption-desorption can be utilized as a key component in the refrigeration cycle as well. In this case, natural zeolites are used as a transfer mechanism moving water as a refrigerant through the condensers and evaporators. The efficiency of the system is based on the non-linearity of the natural zeolite's adsorption isotherms as compared to pressure. Steelhead Specialty Minerals zeolites will adsorb water vapor at low partial pressure and desorb a majority of it at high partial pressure. This difference in partial pressure may be achieved through temperature changes which would be experienced in a solar panel going from high day temperatures to low night temperatures.

NATURAL ZEOLITES

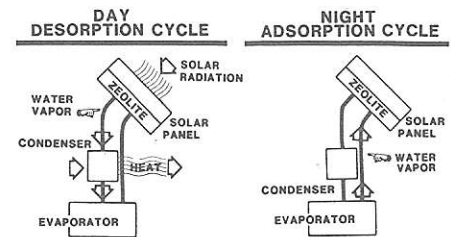


Figure 2 exemplifies the refrigeration cycle allowing natural zeolites to provide both heating and cooling.

This unique mineral has other diversified uses which the following Data Sheets are available:

- #201 General Data
- #202 Agriculture
- #203 Odor Control
- #205 Aquaculture
- #206 Gas Separation
- #207 Water Treatment

For further information or assistance regarding natural zeolites for your particular application, contact:



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