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Review

Salt hydrates as latent heat storage materials:Thermophysical properties and costs

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ABSTRACT

Thermal energy storage is considered as one the most perspective technologies for increasing the efficiency of energy conversion processes and effective utilization of available sources of heat. Advantages and technical attractiveness of the thermal energy storing have resulted in continuously increasing numbers of research activities, especially in the last four decades. Among various applications of thermal energy storage, the heat or cold accumulation in the temperature range from −50 °C to 120 °C has a greater market potential and this can be carried out using a wide range of phase change latent heat materials. Among these materials the salt hydrates deserve a special attention and currently a large number of phase change compositions based on salt hydrates are produced commercially and available on the market. However, reliable data on thermophysical properties as well as their thermal stability over their lifetime is required to build effective storage systems. Currently this data is insufficient and is scattered across numerous sources that are often difficult to access for potential consumers. This paper summarises practically all available original experimental data on the phase change diagram of salt–water systems, melting temperatures, heat of fusion, specific heat, density, thermal conductivity, and thermal diffusivity in solid and liquid states and viscosity in the liquid state for 18 salt hydrates. The above information is provided for major market products on the basis of the salt hydrates for latent heat storage. The wholesale prices for pure salt, salt hydrates, and salt hydrate heat storage compositions are also additionally discussed.

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