# Solar Heat Storage with Salt Hydrates Using Phase Change Effects: Materials, Analysis and Application

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Currently, thermal energy gained from sun can be used for heating purposes. However, at the moment this huge amount of energy cannot be stored and used adequately. During this project I researched on phase change materials (PCM) for decentralized thermal energy storage and examined thier potential as a buffer for heat in residential buildings, for example in combination with a thermal solar system. In the future, solar surplus energy in the form of heat can be stored and used for warming up the building whenever it is needed. The focus of the research has been finding practical solutions to solve this energy problem with salt hydrates and their enthalpy of crystalization. In my project I characterized sodium acetate trihydrate, sodium thiosulfate pentahydrate and their mixture considering their melting point, heat emission behavior, heat storage capacity and supercooling range. Another Focus was the finding of solutions for application-orientated problems (phase separation, supercooling stability, crystallization behavior, crystallization triggering). As a result, a pseudo-binary phase diagram for the system NaCH3COOx3H2O - Na2S2O3x5H2O was created and characteristics of potentially interesting mixtures and the single salts with a varying amount of water were measured. In conclusion it can be said that the analyzed PCM materials have significant advantages over current storage materials. Especially the combination of a low-temperature heat store based on a mixture of nearly 85 % sodium thiosulfate and 15 % sodium acetate (eutectic) with high-temperature heat store seems to be very profitable for various appliances.

**Awards Won:**