

Organic biosourced phase change materials for seasonal thermal energy storage

Our work focused on thermal energy storage in a seasonal basis for heating and domestic hot water supply in buildings. The objective is to develop and study innovative organic bio sourced phase change materials (PCM) able to compete with water and surpass the performances of commonly used PCM today (low cost, high energy density, compactness, thermal losses reduction, environmentally friendly etc.). Sugar alcohols (SA) and their blends could provide high storage energy densities in the range of 120–190 kWh/m³ at temperatures inferior to 100°C with limited thermal losses due to high undercooling. They are compatible with commonly used container materials and with cheap solar collectors. They present long-term stability (no separation, no segregation, controllable thermal degradation) and moderate-to-low volume changes. Their prices are acceptable. First, a screening of SA and SA-blends to select the ones with melting temperatures inferior to 100°C was done. Then, an experimental characterization of the selected SA and SA-blends was performed. This encompasses the measurements of their melting point, their latent heat of fusion and the experimental determination of all key physical properties (specific heat, thermal conductivity, thermal diffusivity, density, viscosity) as a function of the temperature. The activation of the energy discharge process (crystallization) is difficult and the subsequent crystallization

