

DSC Analysis of the Effect of Heating and Cooling Mode on Phase Change Temperature and Latent Heat of Different Kinds of Phase Change Materials

Jan Fořt^{C, S}, Zbyšek Pavlík, Milena Pavlíková, Anton Trník and Robert Černý

Department of Material Engineering and Chemistry, Faculty of Civil Engineering, Czech Technical University in Prague, Prague, Czech Republic
jan.fort.1@fsv.cvut.cz

Latent Thermal Energy Storage (LTES) systems in buildings and buildings envelopes have received serious attention for reducing energy use in building sector. Here, PCMs (Phase Change Materials) that absorb or release the energy equivalent to their latent heat when the temperature of the material undergoes or overpasses the phase change temperature can be effectively applied. The application of PCMs in thermal energy storage has been well known in many fields, such as in solar energy storage, waste heat recovery, and smart air conditioning in buildings. However, PCMs can be incorporated in wallboards, concrete, plaster, roof, underfloor and insulation of buildings in dependence on their properties, encapsulation etc. The effectiveness and usability of particular PCM material for specific part of building envelope must be experimentally verified case by case, in order to develop material having optimal thermophysical properties that allow moderation of interior climate temperature on desired value in dependence on changes of exterior conditions of building. Here, especially suitable phase change temperature, large latent heat and large specific heat of PCMs must be considered. Five different types of commercially produced PCMs are experimentally studied in the paper in order to find proper materials for incorporation in lightweight plaster composition. Within the DSC analysis, the researched materials are exposed to the temperature loading from -10°C to 60°C, with temperature change rate of 1, 5, 10, and 20°C/min. On the basis of DSC tests, temperature of phase change and heats of fusion and crystallization are accessed. The obtain data gives clear evidence of the effect of heating and cooling mode on materials performance, because of significant shift of DSC curves measured for similar material. This effect is closely discussed and evaluated, and the proper materials for application in light weight plasters are identified.