Phase Change Humidity Control Material and its Application in Buildings - DTU Orbit
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The synthesis of novel phase change humidity control material (PCHCM) was achieved by using composite microencapsulated phase change material (MPCM) and hygroscopic material. The PCHCM composite can moderate indoor hygrothermal fluctuations by absorbing or releasing both heat and moisture. The MPCM was synthesized by the microencapsulated phase change material (PCM) with SiO₂ shell. The diatomite was used as hygroscopic material. The morphology of MPCM and PCHCM were measured by scanning electron microscopy (SEM). The thermal properties of the new composites were analyzed with differential scanning calorimetry (DSC). The thermal gravimetric analysis (TGA) was used to study the thermal stability. Both the moisture transfer coefficient and moisture buffer value (MBV) of the PCHCM were measured by two bottle method. The DSC results show that the super-cooling degrees of microcapsule and PCHCM are lower than pure PCM. Both the moisture transfer coefficients and the MBV of PCHCM are higher than pure hygroscopic materials. The influence of PCHCM on indoor hygrothermal environment and building energy consumption was also studied. The results show that the PCHCM can effectively regulate the indoor temperature and relative humidity, thus own a potential energy saving rate of 18% for the test building in research. The overall hygrothermal performance of PCHCM is better than the simple combination of two separate layers of PCM and hygroscopic materials. The PCHCM could be used as an innovative passive material to improve the building energy efficiency.

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