Phase change humidity control material and its impact on building energy consumption

Phase change humidity control material (PCHCM) is a new kind of composite made of high performance phase change material (PCM) microcapsules and hygroscopic materials (e.g. diatomite etc.). The PCHCM composite can moderate the indoor hygrothermal conditions by absorbing or releasing both heat and moisture, and consequently effect the sensible and latent heat load of buildings. In this research, a novel model for analyzing the hygrothermal performance of the PCHCM in built environment is developed and validated by experiments. The new model is then applied to investigate the impact of PCHCM on indoor hygrothermal conditions and building energy consumption in an office building under different climates (Beijing, Paris, Atlanta, and Guangzhou). The simulation results show that PCHCM has a great impact on the building energy performance in Paris and Atlanta climates, which have a large temperature and humidity difference between day and night. The maximal potential energy saving rate could be up to 19.57% in Paris. The model and analysis will provide a guidance for the application of PCHCM in different climate conditions.

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