

Study on the Thermal Conductivity about Porous Materials in Wet State

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Abstract : The thermal conductivity of porous materials is closely related to the thermal and moisture environment and the overall energy consumption of the building. The study of thermal conductivity of porous materials has great significance for the realization of low energy consumption building and economic construction building. Based on the study of effective thermal conductivity of porous materials at home and abroad, the thermal conductivity under a variety of different density of polystyrene board (EPS), plastic extruded board (XPS) and polyurethane (PU) and phenolic resin (PF) in wet state through theoretical analysis and experimental research has been studied. Initially, the moisture absorption and desorption properties of specimens had been discussed under different density, which led a result indicates the moisture absorption of four porous materials all have three stages, fast, stable and gentle. For the moisture desorption, there are two types. One is the existence of the rapid phase of the stage, such as XPS board, PU board. The other one does not have the fast desorption, instead, it is more stabilized, such as XPS board, PF board. Furthermore, the relationship between water content and thermal conductivity of porous materials had been studied and fitted, which figured out that in the wake of the increasing water content, the thermal conductivity of porous material is continually improving. At the same time, this result also shows, in different density, when the same kind of materials decreases, the saturated moisture content increases. Finally, the moisture absorption and desorption properties of the four kinds of materials are compared comprehensively, and it turned out that the heat preservation performance of PU board is the best, followed by EPS board, XPS board, PF board.

Keywords : porous materials, thermal conductivity, moisture content, transient hot-wire method

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