Abstract

This thesis is part of the research line on Moisture Transfer and Hygroscopic Behavior of Buildings, started in 2005 by its supervisors, within the activities of the EnediMOIST group.

Satisfying the demand of comfort in an efficient and sustainable form from an energetic point of view has become one of the keys of the successful enforcement of the requirements of European Directives of Energy Efficiency imposed to the building sector. Therefore, it is necessary to fully develop passive solutions that allow the fitting out of buildings with minimum energy consumption standard. A way to help to minimize dependency on HVAC systems to achieve an adequate hygrometric conditions in buildings, is the development and use of materials with a significant capacity to buffer the ambient relative humidity moisture oscillations, thus the system works the minimum. This capacity is called Moisture Buffer Value.

This property plays an important role in the hygroscopic balance of the interior spaces. It affects both the maintenance of comfort conditions and the energy demand due to ventilation.

In one hand, worries in edification due to indoor air quality and the effects that humidity can cause in health have increased the interest on the buffering capacity of surface materials. On the other hand, the attainment of buildings with net zero energy consumption (NZEB) requires the development of this research-line and its enforcement in edification in order to obtain new building materials that will contribute with many advantages in the development of strategies on passive systems.

Plasterboard (as indoor coating enclosure) will be studied as a passive method. This indoor coating is widely used in construction; therefore, it is interesting to know its performance in this area. We will develop a mathematical model that will allow us to predict the influence of MBV in the hygroscopic balance of houses in different climate zones in Spain. This model will be validated through full-scale tests, both in scaled testing rooms and real houses. The study of MBV in real houses is currently very scarce, so it is a highly innovative study. The impact of this passive system on ventilation systems operation will be analysed as well.

Key words: Moisture buffering capacity; Moisture buffer value; Building materials; Material properties; Indoor air quality; Energy savings.

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