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Relevance of Reliability Approaches to Predict Mould Growth in Biobased Building Materials

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Abstract : Mould growth in living environments has been widely reported for decades all throughout the world. A higher level of moisture in housings can lead to building degradation, chemical component emissions from construction materials as well as enhancing mould growth within the envelope elements or on the internal surfaces. Moreover, a significant number of studies have highlighted the link between mould presence and the prevalence of respiratory diseases. In recent years, the proportion of biobased materials used in construction has been increasing, as seen as an effective lever to reduce the environmental impact of the building sector. Besides, bio-based materials are also hygroscopic materials: when in contact with the wet air of a surrounding environment, their porous structures enable a better capture of water molecules, thus providing a more suitable background for mould growth. Many studies have been conducted to develop reliable models to be able to predict mould appearance, growth, and decay over many building materials and external exposures. Some of them require information about temperature and/or relative humidity, exposure times, material sensitivities, etc. Nevertheless, several studies have highlighted a large disparity between predictions and actual mould growth in experimental settings as well as in occupied buildings. The difficulty of considering the influence of all parameters appears to be the most challenging issue. As many complex phenomena take place simultaneously, a preliminary study has been carried out to evaluate the feasibility to sadopt a reliability approach rather than a deterministic approach. Both epistemic and random uncertainties were identified specifically for the prediction of mould appearance and growth. Several studies published in the literature were selected and analysed, from the agri-food or automotive sectors, as the deployed methodology appeared promising.

Keywords : bio-based materials, mould growth, numerical prediction, reliability approach
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