

Development of porous ceramics as wall tiles with humidity controlling and antimicrobial characteristics from modified Diatomaceous Earth (DE): potential to improve indoor air quality

ABSTRACT

Background: Indoor humidity is one of the indoor comfort issues in indoor environment in Malaysia. Imbalance of indoor humidity would arise when there is an inefficient use of air-conditioning system which causes overgrowth of microbes. The use of ceramics from Humidity Control Materials (HCM) is one of the solutions to regulate indoor air humidity and reduce bacterial growth and thus preventing problem related to Sick Building Syndrome (SBS). Objective: The aim of this study is to develop porous ceramics as walling materials in the form of tiles with humidity controlling ability and antimicrobial characteristics from modified Diatomaceous Earth (DE). Method: This experimental study consists of the development of porous ceramics as wall tiles from DE, waste glass and oyster shell in several formula (80%, 70%, 60% and 50% DE). The developed porous ceramics were tested for its ability for humidity adsorption and desorption, strength test and anti-microbial assay test. Result: The humidity adsorption desorption ability of the tiles was increased as the DE content increased. The humidity adsorption and desorption performance for modified DE was within the range of 3-5%. The inhibition zones against *S. aureus* and *P. aeruginosa* depends on the percentage of DE and it increases as the content increases. On the other hand, the inhibition zones for *S. aureus* depends on the percentage of oyster shell and it increases as the content increases. The average of clear zone against bacterial was 15 mm. The impact test found that the formula of 50% DE has the greatest impact test compared with three other ceramics. Conclusion: This study found that a suitable ratio for porous ceramics with humidity controlling and anti-bacteria characteristics could be developed by using 50% modified DE. The modified DE added with local and low-cost materials have the potential to solve the problem of humidity imbalance and microbial growth in office settings can be solved in order to reduce sick building syndrome and ensure productivity of workers is maintained.

Keyword: Anti-bacteria; Oyster shell; Calcium oxide; Indoor air quality; Relative humidity