Application of low cost gamma ray computed tomography to determine the water transport in sisal fiber reinforced cementitious composites

Flávio de A. Silva*, Iran S. Aragão Filho, Romildo D. Toledo Filho, Eduardo M. R. Fairbain and Fernando L. B. Ribeiro

*Department of Civil Engineering
COPPE/Universidade Federal do Rio de Janeiro
Caixa Postal 68506, 21945-970, Rio de Janeiro – RJ, Brazil
fsilva@coc.ufrj.br

The water movement in construction materials is of great importance to determine the deterioration mechanisms, hence the durability of such materials. Methods of measuring moisture content are numerous and vary in accuracy, ease of use and reliability. In this paper a low cost gamma ray based computed tomographer with a radioactive source of Americium-241 was used. An experimental program was carried on using the computed tomography (CT) technique to determine the water movement in cement composites reinforced by long aligned sisal fibers when subjected to capillary absorption. The moisture and density profiles were determined through the thickness of the material during time. The hydraulic diffusivity ($D(\theta)$) and conductivity ($K(\theta)$) were determined using the appropriate equations. The porosity of the composites was investigated using mercury intrusion porosimetry (MIP) and tunneling atomic force microscopy. Finally, a finite element program was developed to simulate the capillary absorption during time allowing to evaluate the moisture profiles and content in each point of the sample.

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