



Application of Hot-ball sensor for investigation of water diffusion in sandstone and marble

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Cultural and historical monuments are mostly constructed of porous materials. This paper is focused on water transport and moisture determination in porous structures. In these materials plays moisture a dominant role in their deterioration. Stones with different porosities, sandstone 17,8% and marble 0,3% water porosity were investigated. Hot-ball method was used for monitoring water diffusion. Measurements were carried out by inserting Hot-ball sensors in specimen in different positions along diffusion path. The Hot-ball sensors composed of two components (thermometer and resistance) in diameter around 2 mm were fixed with epoxy in holes drilled in material. Specimens block in size of 50x50x100 mm with lateral surfaces and opened bottom and upper surfaces were prepared for investigation of the one-dimensional water diffusion. The specimen was put in vertical position into the special mechanism that keeps a constant water level about 3mm of the bottom. The principle of Hot-ball method is based on generation of a constant heat flux from the spherical source into the surrounding material and at the same time its temperature until a stabilized value was scanned. Heat source output of 11 mW was used that corresponds to temperature changing about 1 K. The thermal conductivity was calculated from temperature response, and is correlated to the water content in material. Experiments were performed at 25 °C and 30 °C. In addition a cycling specimen temperature was used during water diffusion. The experimental set up for investigation of water diffusion in stones is described. Results of water diffusion for different temperatures and moisture conditions are presented.