

Investigation of Porous Stone Material by Pulse Transient Method Using Model for Cuboid Form Samples and Influence of Heat Loss Effect

Vlastimil Bohac^{C, S} and Viliam Vretenar

*Institute of Physics, Slovak Academy of Sciences, Department of Metals, Bratislava, Slovakia
bohac@savba.sk*

Peter Dieska

FEI - STU, Department of Physics, Bratislava, Slovakia

The recent problems of building stones durability are connected with deterioration processes invoked by different climate conditions that destroy material in time. To understand all the circumstances of these processes, we have to know and investigate the thermal properties under different environmental conditions. Testing methodology uses typical geometry of the specimen in cylindrical or cuboid form. The pulse transient method measures all three basic thermophysical parameters e.g. thermal conductivity, thermal diffusivity and specific heat. Recently a new model was developed to take into account disturbance of heat loss effect that is realized through heat transfer coefficient in between the sample surface and the surrounding atmosphere. This effect causes inaccuracy of measurement. The previous models were derived for infinitive large specimen geometry. The new model accounts for the heat transfer coefficient, the final geometry of the specimen and the heat sinks temperature at both ends of the specimen set up. The model was tested on two porous stone materials and results were compared with data calculated by an ideal model for infinitively large specimen geometry. Analysis of the new model pointed out the behavior of the thermal system and thus helps with optimization of the specimen geometry for standard measurements. Analysis is based on the sensitivity coefficients calculations as well as uncertainty analysis that help to solve most of the important experimental parameters and requirements without conducting measurements.