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Thermophysical properties of some natural stones measured by transient techniques

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Stones belong to porous materials where content of pore significantly influence its thermophysical properties. Thermophysical properties of the Vincenza Arcari, Portland Whitbed, Sander Sandstone and Gioia Marble have been studied for different thermodynamic states, namely in dry and water saturated state. In addition, for Sander Sandstone and Gioia Marble, the freeze/thaw cycle has been studied for frozen water in pores. Porous structure of the individual stones strongly influences the thermophysical properties.

Highly innovative measuring technique, the pulse transient method, has been used for determination of the thermophysical properties. The method gives the specific heat, thermal diffusivity and thermal conductivity within a single measurement. The specimens have been conditioned prior the measurement to obtain the required thermodynamic state. An isothermal measuring regime for determination of the thermophysical properties at the specific temperature or a non-isothermal regime using heating and/or cooling rate of 0.02 K/min for study of anomalies during freezing and thawing process have been used.

A spread of the thawing front in sander sandstone has been studied at the specific thermodynamic conditions. The specimen in a form of 2 blocks 50x50x50 mm was saturated by water and cooled to -10˚C prior the measurement. A plane heat source made of 20 μm thick Ni foil of 50x50 mm size, placed in the contact of the specimen blocks generated a step-wise heat flow. The corresponding anomalies were determined

by thermocouples fixed apart from the heat source in different distances from it. Basic characteristics of the thawing front have been determined.

The work belongs to the experimental one. The contribution presents new experimental techniques that belong to multiparameter methods. Techniques possess high measurement productivity, high flexibility concerning specimen size and thus the adaptability to in-homogenous structure. The technique is transferable to any industrial environment.