Thermophysical Properties of Kaolin-Zeolite Samples up to 1100 °C

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In this study, the thermophysical properties such as the thermal expansion, thermal diffusivity and conductivity, and specific heat capacity of ceramic samples made from kaolin and natural zeolite are investigated up to 1100 °C. Kaolin is the most commonly used material in the ceramic industry. Zeolites are microporous, hydrated crystalline aluminosilicates which are porous and widely used due to their structure and absorption properties. Samples are prepared from Sedlec kaolin (Czech Republic), which contains more than 90 mass % of mineral kaolinite. A varying amount of the kaolin (0 % – 50 %) is replaced by a natural zeolite from Nižný Hrabovec (Slovak Republic). A major mineral phase of this zeolite is clinoptilolite. The measurements are performed on cylindrical samples by a thermogravimetric analysis, a horizontal push – rod dilatometer, and a laser flash apparatus. Samples made from pure kaolin and zeolite are also subjected to these analyses. The temperature interval is chosen from room temperature up to 1100 °C. The results show that the mass loss of ceramic samples decreases and the relative shrinkage increases with the amount of zeolite in the samples. The bulk density decreases with zeolite content in a raw ceramic sample but after reaching the firing temperature 1100 °C, the bulk density is almost the same for all studied kaolin-zeolite samples. The thermal diffusivity of the samples decreases with the amount of zeolite and in addition, it decreases during heating up to 1100 °C for all samples.