Effects of Microstructures and Mineralogical Variables to the Thermal Shock Resistance of Carbonate Soapstone

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Soapstone industry utilizes different types of soapstone mainly as a construction material for fireplaces. In this application, they have to meet the requirements of different temperature conditions. Some components on the outer surface of the fireplaces warm only up to 70 °C, whereas other parts are exposed to compustion gases with temperatures of as high as 1000 °C. Mineralogical and structural knowledge is required to be able to place an appropriate type of soapstone in an appropriate position in the fireplace construction. This will make it possible to employ higher temperatures and achieve more particulate-free combustion allowing soapstone industry to develop more efficient and more environmentally friedly fireplaces.

Of many soapstone types, which differ from each other in their chemical composition and thermal properties, carbonate soapstone and its microstructural variations were investigated in this study. Exposing carbonate soapstone samples representing different textural types to steep temperature gradients, it was possible to determine the parameters that effect the ability of the rock to resist thermal shock.

The results indicate that the type of microtexture is an important factor in controlling the thermal shock resistance of carbonate soapstone. The soapstone samples with a high thermal shock resistance show deformation textures, such as crenulation cleavage and S/C- mylonite. A strong negative correlation was observed between the thermal shock resistance and the length of cleavage domains. Also a slight elevation in the iron concentration of talc and magnesite was discovered to improve the thermal shock resistance of carbonate soapstone. Attention should especially be paid to the length and planarity of cleavage domains of spaced foliation occurring in studied carbonate soapstones.