

Temperature Induced Internal Stress in Marble

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Stone physical weathering, deterioration and damage (e.g. bowing, cracking, microfracturing) represent a serious problem for preservation of sculptural and architectural-heritage objects. Although different mechanism of such degradation might be in responsible (e.g. chemical or biogenic), there is an understanding in geological community about physical reasons of stone degradation and role of stress. In this work Carrara marble was a chosen object of investigation: a calcitic type with ~20% of dolomite. Neutron diffraction was used to investigate the phase composition, the texture, and the strain/stress in calcite and dolomite phases in a bulk marble sample. Evolution of the stress state was studied by measuring strains in calcite and dolomite at two temperatures with clear evidence of the thermally induced microstresses. Results are discussed in connection to the theory of composite materials and a micro-mechanical explanation of the general problem of marble deterioration is suggested.

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