CHEMICAL MAPPING OF MICRO-PHASES AND MICROSTRUCTURES IN PYROXENE MINERALS FROM A HIGH PRESSURE METAMORPHIC ROCK USING SYNCHROTRON X-RAY SPECTROMICROSCOPY

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Microstructures and micro-inclusions in minerals can provide information about the genesis and evolution history of rocks. X-ray PEEM is a useful tool for studying microstructures and microchemistry of minerals. It can provide spatially resolved chemistry about the mineral micro-phases and interfaces. A sample from a high pressure metamorphic rock from northern Dabie Mountain of China was investigated using the SPHINX X-PEEM and transmission electron microscopy (TEM). The sample was a product of the Triassic continental collision between the Sino-Korean and Yangtze cratons in east-central China. The recent discovery of eclogite-facies rocks re-equilibrated under granulite-facies conditions. X-PEEM and TEM data indicate that silica-rich glass precipitates are uniformly distributed in the central area of pyroxene. Our results indicate that the micro-phases inside the host pyroxene formed during subduction of the continental plate and have experienced high pressure in the upper mantle and high temperature in the lower crust during a short time period. Such kinds of product and texture may indicate extremely fast subduction and exhumation of the paleo-continent plate in the Dabie Mountain area.

Figure 1: The obtained X-ray PEEM image showing the micron and sub-micron size silica-rich phases inside a host pyroxene mineral. The extracted spectra of Fe L-edges and oxygen K-edges from the micro-phase and matrix showing the chemical difference between the micro-phase and the pyroxene matrix.