

## Microanalysis of minor elements in scapolite from the Madurai Granulite Block, southern India

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The Madurai Granulite Block, which is one of five Pan-African (ca. 550 Ma) granulite-facies crustal blocks in southern India, shows numerous evidences for ultrahigh-temperature (T above 950°C) metamorphism such as sapphirine + quartz, spinel + quartz, and orthopyroxene + sillimanite + quartz assemblages and Al-rich orthopyroxenes. This block has been the focus of petrological studies for the last two decades not only for constructing tectonic models for amalgamation and evolution of Gondwana supercontinent, but also for understanding unique geological process that gave rise to ultrahigh-temperature crustal metamorphism. Particularly, calc-silicate rocks, which are the main focus of this study, provide effective tools for investigating the thermal and fluid history of this block because mineral assemblages of these rocks varies significantly depending on metamorphic conditions (e.g. pressure, temperature, and CO<sub>2</sub> activity) as well as bulk-rock chemistry.

Scapolite, the chemical composition of which can be expressed as (Na, Ca)<sub>4</sub>Al<sub>3</sub>(Al, Si)<sub>3</sub>Si<sub>6</sub>O<sub>24</sub>(Cl, CO<sub>3</sub>, SO<sub>4</sub>), is a common mineral in high-grade calc-silicate rocks. The mineral may contain three mobile phases i.e. Cl, CO<sub>2</sub> and SO<sub>3</sub>. Therefore, microanalysis of these elements in scapolite is regarded to be an effective tool to monitor fluid composition and flow in deep crust.

Chlorine and sulfur content in scapolite can be analyzed by electron microprobe analyzer (EPMA). The results indicate that the scapolites from Madurai Block almost free from sulfur. The result is consistent with the evidence that S-rich scapolite occurs only in mafic to ultramafic xenoliths in alkaline intrusives. The analytical results also indicate that scapolite from southern India contains about 0.4-0.9 wt. % Cl. Although subhedral scapolite coexisting with clinopyroxene and/or calcite shows no compositional zoning, elongated scapolite coexisting with K-feldspar shows non-linear decrease in Cl from core (0.90-0.94 wt. %) to rim (0.38-0.40 wt. %) showing positive correlation with respect to K contents. This compositional change might have been caused by metasomatic reactions including K-feldspar and metamorphic fluid.

Microanalysis of carbon, another mobile phase that may be included in scapolite, has not been carried out so far because EPMA is not suitable for light element analyses. We examined appropriate coating material and analytical conditions (e.g. sampling time, acceleration voltage, and sample current) for carbon analysis using JEOL JXA 8621 microanalyzer at Research Facility Center for Science and Technology, University of Tsukuba, and succeeded in semi-quantitative analysis of CO<sub>2</sub> content in scapolite using K-ratios. The results of this study will give us valuable information on pressure-temperature-fluid history of the Madurai Granulite Block.