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# ON CALC-SILICATE ROCKS FROM WEST ONGUL ISLAND, LÜTZOW-HOLM BAY, EAST ANTARCTICA (ABSTRACT)

Noriyoshi TSUCHIYA[1], Toshiaki SHIMURA[2] and Geoffrey L. FRASER[3]

[1]*Department of Resources Engineering, Tohoku University, Sendai 980-77*
[2]*Graduate School Science and Technology, Niigata University, Niigata 950-21*
[3]*Research School of Earth Sciences, Australian National University, Canberra, ACT 0200, Australia*

Calc-silicate rocks were found in West Ongul Island during geological survey of JARE-35 in 1993-1994. They occur in the west side of the central part of West Ongul Island as thin layers of 20 to 50 cm in width along metabasite, and are exposed in a limited area of two outcrops.

The calc-silicate rocks occur with marble layers which are concordantly intercalated with metabasites and other gneisses. The marble layers of a 10 to 15 cm in width consist mainly of medium- to coarse-grained calcite. Compositional layering which comprises a phlogopite zone, a diopside+tremolite zone and a diopside+calcite zone is arranged parallel to the marble layer in this order. The following characteristics are found in mineral associations:

(i) Garnet, olivine (forsterite) and wollastonite are not found in any zones,
(ii) Calcite contains MgO less than 1 wt%,
(iii) Diopside ($X_{Mg}=0.81$-$0.85$), tremolite ($X_{Mg}=0.77$-$0.96$), anorthite, scapolite, sphene and spinel ($X_{Mg}=0.52$-$0.66$) occur.

Equivalent anorthite values of scapolites (EqAn) of two samples, are 58.8 and 61.6, respectively, and also Na/(Na+Ca) ratios are 0.28 and 0.25. These results indicate that chemical compositions of scapolites are not on the tie-line between marialite and meionite.

Possible reactions among minerals including phlogopite, calcite, quartz, diopside, K-feldspar and tremolite in the system $CaO$-$MgO$-$KAlO_2$-$SiO_2$-$H_2O$-$CO_2$ are as follows:

$$2\text{quartz}+3\text{calcite}+\text{tremolite}=5\text{diopside}+3CO_2+H_2O, \quad \text{(r. 1)}$$
$$6\text{quartz}+3\text{calcite}+\text{phlogopite}=3\text{diopside}+\text{K-feldspar}+3CO_2+H_2O, \quad \text{(r. 2)}$$
$$24\text{quartz}+6\text{calcite}+5\text{phlogopite}=3\text{tremolite}+5\text{K-feldspar}+6CO_2+2H_2O, \quad \text{(r. 3)}$$
$$4\text{quartz}+2\text{diopside}+\text{phlogopite}=\text{tremolite}+\text{K-feldspar}, \quad \text{(r. 4)}$$
$$6\text{calcite}+3\text{tremolite}+\text{K-feldspar}=12\text{diopside}+\text{phlogopite}+6CO_2+2H_2O. \quad \text{(r. 5)}$$

Equilibrium constants of the above reactions depend on the chemical composition of vapor phase except reaction (r. 4). Therefore, metamorphic temperature and pressure could not be determined directly by mineral assemblages and compositions. But oxygen stable isotopic composition of silicate minerals could evaluate metamorphic temperature. Preliminary result of the equilibrium temperature of oxygen exchange reaction between anorthite and fluid is estimated to be 630°C. Metamorphic temperature calculated by oxygen isotope geothermometry is in agreement with the maximum temperature derived from the petrological evidence for the other gneisses in this area. In other words, it suggests that oxygen isotopic composition of silicate minerals in calc-silicate rocks have remained unchanged since equilibrium.

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