MITT.ÖSTERR.MINER.GES. 151 (2005)

PILOT COMPRESSION STUDY OF ALBITE GLASS AND H_2O SATURATED ALBITE MELT

Mirwald, P. W.

Institut für Mineralogie und Petrographie, Universität. Innsbruck, Innrain 52, A-5020 Innsbruck, Österreich
e-mail: peter.mirwald@uibk.ac.at

A very recent experimental re-examination of the high-pressure reaction albite = jadeite + quartz in presence of traces of H_2O has revealed that the reaction boundary is characterised by two inflections at 19 kbar/700°C and 27 kbar/1000°C of which the first one is strikingly pronounced (MIRWALD, 2005a). The occurrence of these inflections may be related to anomalous PVT behaviour of H_2O (MIRWALD, 2005b). However, the very pronounced form of the inflection at 19 kbar allows to infer that further property changes of the participating phases might be involved. One striking fact is that the onset of the low/high albite (order-disorder) transformation boundary is intersecting the albite breakdown boundary at these P-T conditions. Furthermore, the small amount of H_2O present in these experiments implies that small amounts of hydrous melt occur. Therefore, an anomalous PVT behaviour of the albite melt as a contributing factor to this 19 kbar inflection was taken into consideration.

To explore the relevance of this hypothesis piloting isothermal compression experiments on dry albite glass were performed in the temperature range between room temperature and 700°C up to 25 kbar, and on H_2O saturated albite melt between 700 – 800°C and 7 – 30 kbar. The experiments were performed with a piston cylinder apparatus (1/2 inch vessel) using conventional salt cell assemblies and 50 - 80 mg samples. The compression behaviour was monitored by DPA technique (MIRWALD, 2005b).

The piloting experiments performed indicate anomalous compression behaviour of the glass and melt as well at 16-17 kbar, thus suggesting an almost temperature independent P-T course of this phenomenon. IR spectroscopy of quenched samples shows significant changes in the band range 600 to 1200 cm^{-1}. Although the effects observed in the albite glass from runs below 700°C might be attributed to a meta-stable phenomenon, the observations obtained in the stability field of the hydrous liquid rather speak in favour of a stable effect. This interpretation seems supported by the melting curve of dry and of "slightly wet" albite (BOYD & ENGLAND, 1963) and BÖTTCHER et al., 1982). A pronounced increase in curvature of the melting boundary in the pressure range between 15 and 20 kbar might be an indication for a triple point topology between albite and two structurally different melts.

References

BÖTTCHER, A.L., BURNHAM, C.W., WINDOM, K.E. & BOHLEN, S.R. (1982): J. Geol., 90, 127-138.

BOYD, F.R. & ENGLAND, J.L. (1963): J. Geophys. Res. 68, 311-323.

MIRWALD, P.W. (2005a): Abstract, 7th Int. Eclogite Conference 2005, Seggauberg, Austria.

MIRWALD, P.W. (2005b): Europ. J. Mineral., in press.