THE EQUILIBRIUM REACTION ALBITE = JADEITE + QUARTZ - A RE-EXAMINATION IN PRESENCE OF SMALL AMOUNTS OF H_2O AND AT DRY CONDITIONS

MIRWALD, P.W.

Institut für Mineralogie und Petrographie, Innrain 52, A-6020 Innsbruck, Austria
e-mail: peter.mirwald@uibk.ac.at

The breakdown reaction of albite, $NaAlSi_3O_8$ into jadeite and quartz is considered the transition into the regime of high pressure metamorphism. Results obtained by slightly "wet" (HOLLAND, 1980) and dry performed experiments (BELL, 1964) are discrepant. The re-examination was performed with a piston cylinder apparatus using synthetic albite glass as starting material. While in „wet" experiments the sample material was moistened by breathing into the filled capsule, the capsules loaded for dry experiments were heated to 800 °C for 5 hours before welding shut. The reaction was determined by differential pressure analysis (DPA) technique (MIRWALD, 2004) and controlled by additional quench experiments. The preliminary results are displayed in Fig.1.

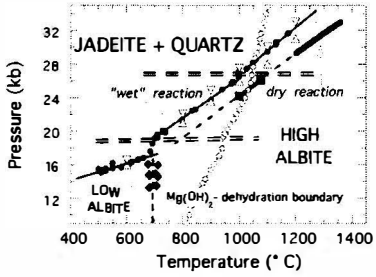

Fig. 1: The breakdown reaction of albite into jadeite + quartz under slightly „wet" and dry conditions.

Although the „wet" data (closed circles) grossly confirm the work by HOLLAND (1980) (open triangles), the detailed work revealed a complex fine-structure of the boundary: a pronounced inflection at 18 kbar / 680 °C including a triple point with the low-high albite transition boundary (closed diamonds), and a further weaker inflection at 27 kbar / 1000 °C. The dry reaction boundary (tick line: BELL (1964); closed squares: this study) determined between 1000 to 1350 °C is located at significantly lower pressures (2 - 3 kbar) indicating that albite is stabilised by H_2O. The inflections of the „wet" breakdown boundary are attributed to two PVT anomaly boundaries of H_2O (double dashed lines). This kind of effects have already been observed at the dehydration boundary of brucite, $Mg(OH)_2$ (open circles) (MIRWALD, 2004).

References

BELL, P.M. (1964): Carnegie Year Book, 63, 171-174.
HOLLAND, T.J.B. (1980): Am. Min., 65, 129-134.
MIRWALD, P.W. (2004): Lithos, Suppl. 73, 1-2, S76, and J. Europ. Mineralogy, 2005 in press.