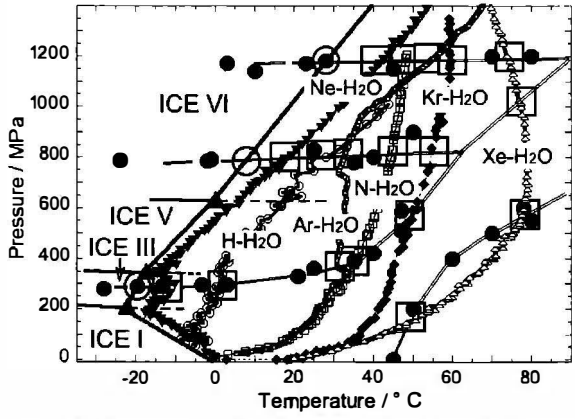
# DECOMPOSITION OF CLATHRATE HYDRATES AS INDICATOR OF ANOMALOUS PVT-BEHAVIOUR OF WATER

Mirwald, P W

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

Clathrate are minerals characterized by an $H_2O$-cage structure hosting therein various gaseous molecules – mostly of low molecular weight. Because of considerable economical importance, a vast amount of studies is concerned with the complex properties of this mineral group. This study was motivated by a previous work on the compression behaviour of water between 0 ° and 80 °C up to 1.2 GPa (MIRWALD, 2005a) revealing a complex P-T system of anomalies. The PVT anomalies of water may be traced by compression experiments, by detailed determinations of the P-T course of phase transition boundaries (e.g. melting curve of ice), or by decomposition reactions (e.g. dehydration reactions). Dehydration studies on gypsum, portlandite and brucite have shown that the water anomalies actually extent far into the P-T range of petrological relevance (MIRWALD, 2008, 2005b, c). Detailed studies on the P-T relations of clathrate hydrates have been conducted by Dyadin and co-workers (e.g. Dyadin et al., 1999). Out of the great number of investigations those on noble gas hydrates and H- and N-hydrate have been chosen, showing a minimum of interaction between guest molecule and hosting $H_2O$-cage. The figure gives a view on the previously outlined system of water anomalies (closed circles connected by double lines). At 290, 780 and 1180 MPa the melting curve of ice is characterized by anomalous dP/dT-slope inflections (open circles; MIRWALD, 2010). On the diagram superimposed the decomposition curves of various clathrate hydrates (Ne-, H-, Ar-, N-, Kr- and Xe-$H_2O$) are given. In all cases the decomposition curves of the clathrate hydrates show at or in very next vicinity of the water anomalies a discontinuous behaviour of the dP/dT-slope (open squares) that is to be related to the anomalous PVT behaviour of $H_2O$.




DYADIN, Y A., LARIONOV, E. G., MANAKOV, A. Y., ZHURKO, F. V., ALADKO, E. Y., MIKINA T. V KOMAROV, V Y. (1999): Mendeleev Commun., 9 (5), 209-210.
MIRWALD, P W. (2005a): Journal Chemical Physics 123, 124715, 1-6.
MIRWALD, P W. (2005b): Geophys. Res. Abstr. 7, EGU05-A-04554.
MIRWALD, P W. (2005c): Eur. J. Mineral., 2005, 17, 537-542.
MIRWALD, P W (2008): Journal Chemical Physics, 128, 074502, 1-7
MIRWALD, P W (2010): Int. Mineral. Ass., 21-27 Aug.2010; Acta Mineral.-Petrograph. Abstr.-Ser. 6, 813.