

In-situ neutron scattering experiments of ice VI under high pressure and low temperature

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In-situ neutron scattering experiments for ice VI under high pressure and low temperature were carried out in order to investigate the long-standing problem of the order-disorder transition of ice VI. We used 99.9 % D₂O as sample, in contrast with the study of Salzmann et al. (2009) who used D₂O with 0.01 mol/L DCl. We also used the newly developed P-T variable cell (Komatsu et al., in press) which allows us to explore pressure and temperature individually; it is essentially important for this study because compression under low-temperature is necessary to make fine powdered iceVI. Cup-shaped WC anvils, TiZr encapsulating gaskets and duralumin support ring were used as anvils and gaskets, respectively. Their combination of anvils and gaskets has much less attenuation for both incident and scattered neutron; the intensity is 2.6-5.2 times more than the conventional single toroidal anvils. Another run which includes Pb as a pressure maker with D₂O was also conducted to find the anomaly in P-V-T relationship, which was reported by Mishima et al. (1979).

The neutron diffraction patterns taken at any P-T conditions we explored (0.6~1.7 GPa, 100-240 K) were well explained by the disordered iceVI structure model, and no additional peaks were found in this study. The observed V-T relationships at 1.3 GPa have no clear anomaly, but seems normal, which means that no strong evidence to show the transition from disordered to ordered-state was observed.

References

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