

MS14-P16 | ISOTOPE EFFECTS IN RECOVERED HIGH-PRESSURE PHASES OF ICE.

Fortes, Dominic (ISIS neutron spallation facility, Chilton, GBR); Howard, Christopher (University College London, London, GBR); Baron, Geoffrey (University College London, London, GBR); Wood, Ian (University College London, London, GBR)

Water ice is one of the most fundamental molecular solids and one of the most abundant minerals in the cosmos. In addition to being less dense than its own liquid, the ambient-pressure polymorph of ice (ice *Ih*) exhibits two other atypical properties: firstly, negative volume thermal expansion below 60 K; secondly, an anomalous volume difference due to isotopic substitution (i.e., the molar volume of D₂O is larger than H₂O).

Here we report some new results for the high-pressure forms of ice. We have prepared samples of both H₂O and D₂O in the ice II, ice III / IX and ice VI structures and recovered them to ambient pressure under liquid nitrogen. The specimens were mixed with a silicon standard and high-precision lattice parameters were measured between 10-150 K at ambient pressure using HRPD, one of the highest resolution neutron powder diffraction instruments in the world.

We determined that the volume isotope effect is normal in ices II, III / IX and VI, although this fact hides some interesting subtleties. Notably, the isotope effect in ice III / IX is normal along the *c*-axis and anomalous along the *a*-axis. This is noteworthy because the *a*-axis of ice III / IX exhibits negative linear expansion below ~ 40 K. Thus it seems, on the basis of only a few examples, that there may be a relationship between anomalous isotope effects and negative expansivity that remains to be explored further.