Anomalies of Heavy Water at Negative Pressure

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Water anomalies have been the focus of experiments and theories for decades [1]. The usual experimental approach, consisting in supercooling of water has brought new insights, but also faces limitations due to the unavoidable nucleation of ice. Thus, a new route has been explored, which consists of bringing liquid water to negative pressure using micron-sized droplets trapped in quartz [2,3], that were synthesized using an internally heated gas pressure vessel between 500 and 700 MPa. The equation of state of the stretched liquid is obtained through Brillouin spectroscopy. Experiments on light water revealed a line of isothermal compressibility maxima and located the line of density maxima down to -137 MPa [4]. The predicted crossing of several lines of anomalies was, however, not observed due to nucleation of vapor. Here, we report on our latest experiments on heavy water at negative pressure. We find anomalies, which are more pronounced than in light water, and we map out their location in the presssure-temperature plane.

References

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