

Czech Chemical Society Lecture

Thursday, April 7, 2022, 14:00

University Campus Bohunice, Kamenice 5, Building B11/room 132

On the Process of the Discovery of a New Ice Polymorph: Ice XIX



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Thursday 7th April 2022, 2.00 pm, B11/132
Lecture of the Czech Chemical Society

The hydrogen-bond is a wonder of nature that not only holds DNA together. Probably, even more importantly, it allows for the unique properties of water, its dozens of anomalies - and makes life possible as we know it. Nonetheless, we still do not understand hydrogen-bonded networks in full and keep learning about them. One of the best fields of study that allows to learn about the richness and variety in such networks is the polymorphism of H₂O-ice. No other substance features more polymorphs than water. In our work we recently discovered the 19th polymorph of ice. In my talk I will describe the process from our initial suspicion, from surprising calorimetric observations, how we learned more and more and how we hypothesized that this has to be due to the existence of an unknown ice phase. I will then describe how we developed the hypothesis and envisioned experimental protocols how to make the unknown ice phase, first as H₂O-ice, and then, even more challenging, as D₂O-ice. The latter was necessary for neutron diffraction experiments - which have ultimately allowed us to find the crystal structure of the new ice, where we had to distinguish between approximately 2000 candidate structures. Only after providing this gold standard in crystallography we had the right to assign the Roman numeral "XIX" to the ice phase discovered in our work. The study of the thermodynamic properties of this ice have then made clear that the phase diagram of water needs to be revised - where a stability range needs to be added below 100 K and near 1 GPa.

Short course: [Crystalline ices, amorphous ices, deeply supercooled water, clathrate hydrates - a journey through the phase diagram of water and beyond the stable phases.](#)

Friday 8th April 2022, 2.00 pm, A08/309