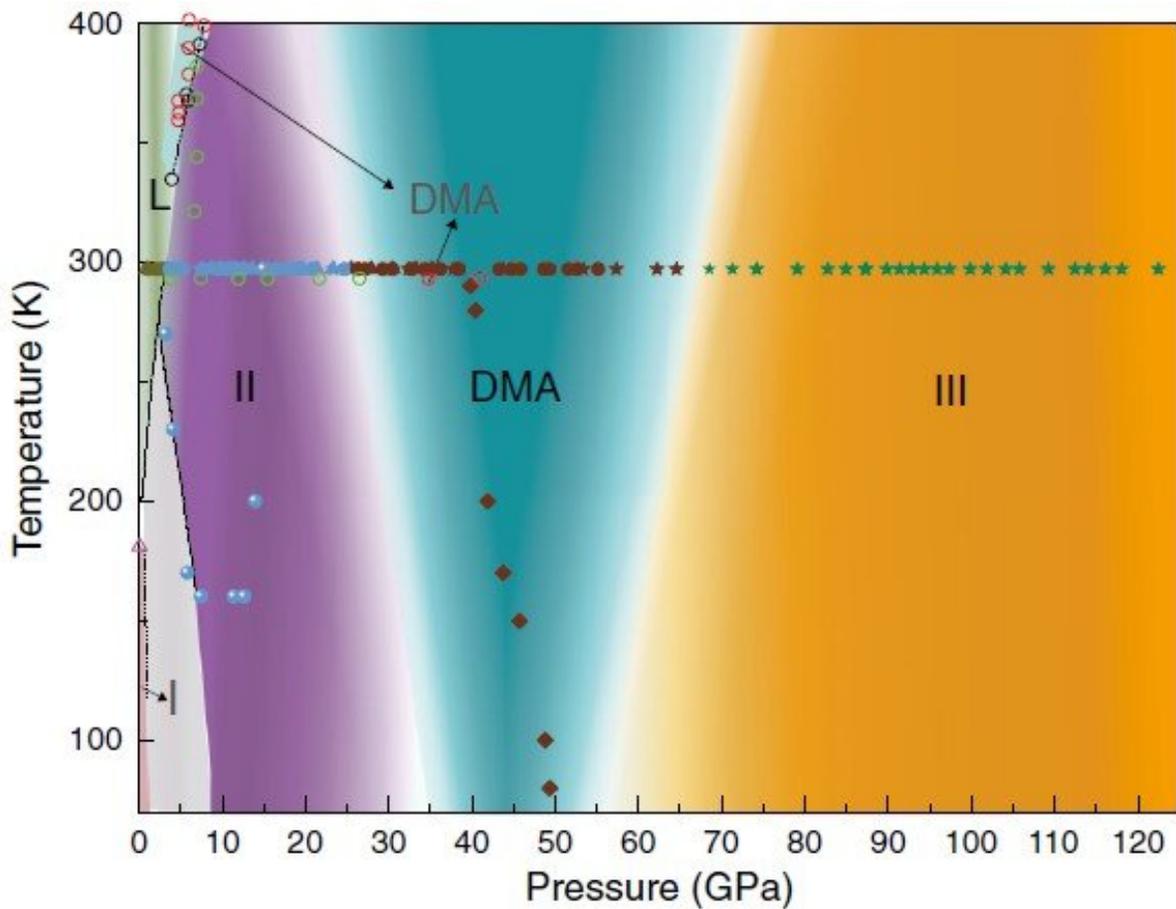


# Ionic phases of ammonia-rich hydrate discovered at high densities

January 12 2021, by Zhang Nannan



The proposed phase diagram of AHH based upon this Letter and low-pressure data from Wilson et al. For the experimental data, different colors depict different phases, and different filled symbols represent different runs. (Image by XU Wan)

A research team has studied the spontaneous ionization of ammonia hemihydrate (AHH) under compression and discovered ionic phases of ammonia-rich hydrate at high densities.

The team was consisted of researchers from the Hefei Institute of Solid-state Physics (ISSP) of the Hefei Institutes of Physical Science (HFIPS), University of Edinburgh, and the Center for High Pressure Science & Technology Advanced Research and the results of this study were recently published in *Physical Review Letters*.

Mixtures of ammonia and water are major components of the "hot ice" mantle regions of icy planets. AHH plays a pivotal role as it precipitates from water-rich mixtures under pressure.

The team compressed an exemplary ammonia-water compound to over 1.2 million atmospheres, corresponding to a depth of about 9,870/8,085 kilometers inside Uranus/Neptune, and tracked its structural and dynamical properties. The calculations demonstrated that the compressed mixture transforms into a very stable ammonium oxide,  $(\text{NH}_4^+)_2\text{O}^{2-}$ .

The presence of such a stable ionic compound deep inside icy planets will influence our understanding about such planets' formation and evolution to the present day. These intriguing ionic phases can exist over a considerably wide [pressure](#) region hence greatly extend the phase diagram of AHH.

**More information:** Wan Xu et al. Ionic Phases of Ammonia-Rich Hydrate at High Densities, *Physical Review Letters* (2021). [DOI: 10.1103/PhysRevLett.126.015702](https://doi.org/10.1103/PhysRevLett.126.015702)

Provided by Chinese Academy of Sciences

Citation: Ionic phases of ammonia-rich hydrate discovered at high densities (2021, January 12)  
retrieved 26 April 2024 from

<https://phys.org/news/2021-01-ionic-phases-ammonia-rich-hydrate-high.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.