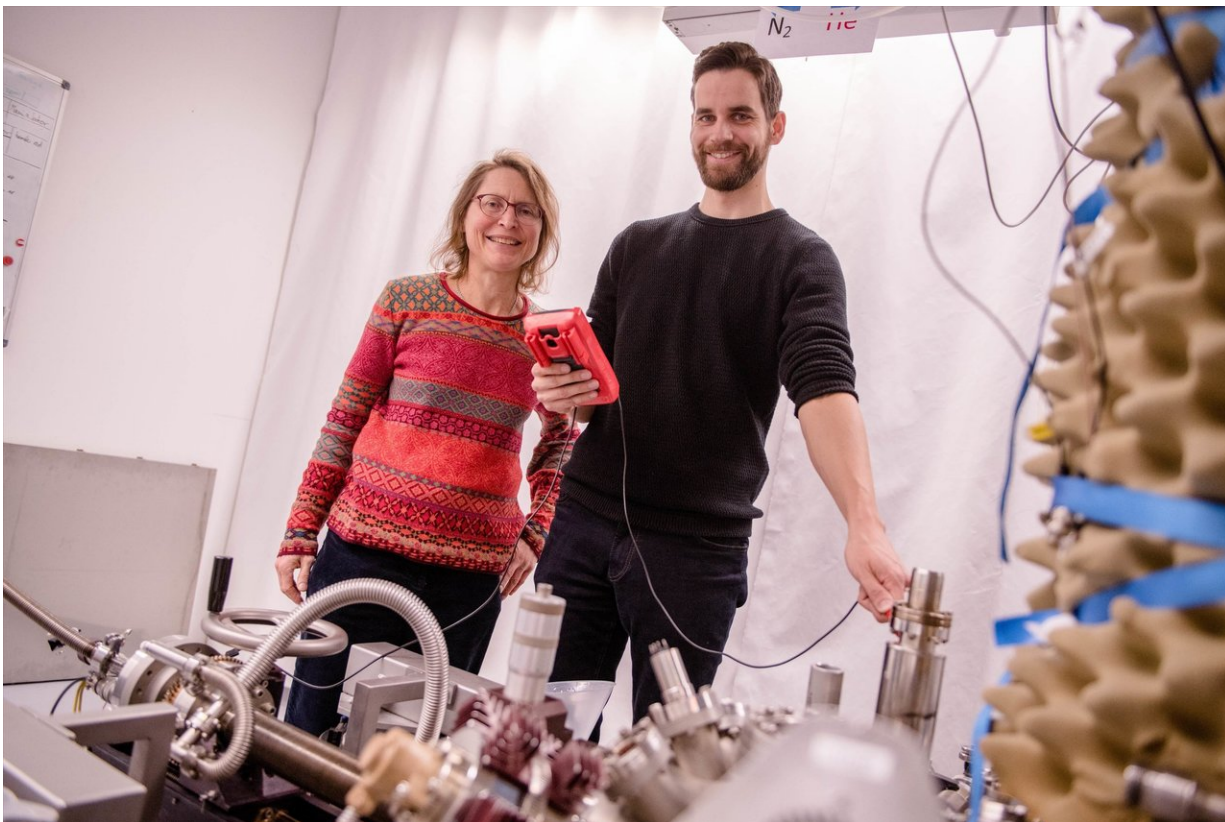


# How a crystal is solvated in water

November 21 2018

---



Karina Morgenstern and Karsten Lucht with the experimental set-up at Ruhr-Universität. Credit: RUB, Marquard

Researchers at Ruhr-Universität Bochum have observed how a molecule from a solid crystal structure is solvated in a liquid solvent at a molecular level for the first time. The process is too fast to decipher at room temperature. The team from the Ruhr Explores Solvation (Resolv)

Cluster of Excellence used microscopic methods that work at particularly low temperatures. The group led by Dr. Karsten Lucht and Professor Karina Morgenstern from the Department of Physical Chemistry I describes the relevant steps in the solvation process in the journal *Angewandte Chemie* on 11 October 2018.

"Understanding the solvation process is of fundamental importance for chemistry, since the knowledge could help to influence the interaction between solvents and solvated molecules in a targeted way and thus to control chemical reactions even more comprehensively," explains Karsten Lucht.

For the study, the chemists analysed crystals of an organic molecule using low-temperature scanning tunnelling microscopy, which operates at minus 265 degrees Celsius. At this temperature, molecular movements come to a standstill, allowing the individual molecules to be imaged.

## Water solvates crystal structure

The researchers fixed the organic molecules onto a special silver surface. The functional groups of the molecules then formed chains. "This structure corresponds to a one-dimensional crystal," explains Lucht. The scientists then added a small amount of water, which attached itself to the organic molecules at defined positions. Finally, they heated the system to minus 193 degrees Celsius, whereby the [crystal structure](#) was completely lost.

"The loss of the molecular order corresponds to the solvation of the organic crystal in a real solution," describes Karina Morgenstern. The individual [organic molecules](#) only interact with the water molecules and can therefore be regarded as solvated. "We were thus able to observe the relevant steps of the solvation process on individual [molecules](#) for the first time, i.e. the dry crystal, the attachment of the solvent to it and its

complete solvation," the researcher says.

**More information:** Karsten Lucht et al. Imaging the Solvation of a One-Dimensional Solid on the Molecular Scale, *Angewandte Chemie International Edition* (2018). [DOI: 10.1002/anie.201808579](https://doi.org/10.1002/anie.201808579)

Provided by Ruhr-Universitaet-Bochum

Citation: How a crystal is solvated in water (2018, November 21) retrieved 9 April 2024 from <https://phys.org/news/2018-11-crystal-solvated.html>

<p>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.</p>
--