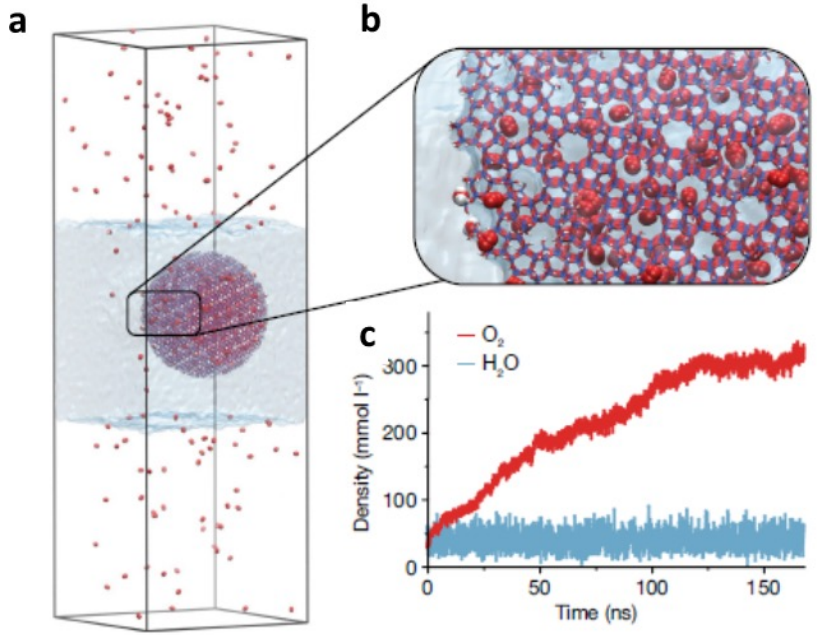
Microporous water to concentrate insoluble gases



a, Setup employed in molecular simulations consisting of a silicalite-1 nanocrystal in water and a headspace of O_2 gas molecules. **b**, A zoomed-in view of the silicalite-1 edge filled with O_2 molecules at the thermodynamic equilibrium. **c**, The change in density of O_2 and H_2O inside an initially dry silicalite-1 nanocrystal over the simulation time.

Reference(s): **Microporous water with high gas solubilities**

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Scientific Achievement

We report a new general method (supported by thermodynamics) to create a network of dry hydrophobic pores in water. The permanent pores are from suspended nanocrystals that concentrate gases in water at much higher capacities than aqueous media.

Significance and Impact

Enhancing the solubility of gases in water is necessary in energy-related and biomedical technologies that depend on the transport of gases (CO_2, N_2, O_2, CH_4) through aqueous fluids, such as fuel cells, electrocatalytic reactions, tissue engineering, in vitro cell culture.

Research Details

- Microporous nanocrystals with hydrophobic internal surfaces and hydrophilic external surfaces were designed and synthesized. The nanocrystals are uniformly dispersed in water to form microporous water.
- The nanocrystals' pores remain dry when the nanocrystals are dispersed in water and the solubility of gases in microporous water more than one order of magnitude higher than in aqueous solutions.