Review of: "Abnormal Properties of Low-Dimensional Confined Water"

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I would like to recommend this inspiring review [1] most comprehensive as insofar I have read. The review is focused on the phenomena, applications, principles, and future directions, regarding the behaviour of water at the nanometre and molecular scales, interacting with other substance and the environment.

It discussed the state-of-the-art knowledge on the following with updated references :

1. on the Hydrophilic/Hydrophobic Solid Surfaces
2. on the water-air interfaces
3. Superfluidity of water transporting in nanochannels
4. Confined in nanopores
5. Confined between biomolecules, DNA, lipid membranes, and protains

It also introduced the concepts of:

1. Relaxed O:H-O bonding network
2. Supersolidity
3. Viscoelasticity and hydrophobicity
4. Skin specific heat and thermal diffusivity
5. Surface charge and dipole
6. Curvature enhanced hydrophobicity
7. Friction less flow
8. Dielectric gradient

Future attention on the following issues would be even promising:

1. Supercooling and superheating. Molecular undercoordination raises the melting point T_m by shortening and stiffening the H-O bond and meanwhile lowers the critical temperatures for ice nucleation T_N and evaporation T_V by lengthening and softening the O:H nonbond [2, 3].
2. Two-phase of the core-shell resolved nanodroplet and nanobubbles. Water and ice share the common supersolid skin [4, 5]. At the nanoscale, polarization plays a significant role.
3. Multifield coupling effect such as compression, electrification, thermal, and molecular undercoordination on the performance of water ice. The joint effect may enhance or compensate the effect of single

perturbation alone. The O:H-O coupling bond responds to the perturbations holds its respective manner of relaxation and polarization.

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3. Sun, C.Q., X. Zhang, J. Zhou, Y. Huang, Y. Zhou, and W. Zheng, *Density, Elasticity, and Stability Anomalies of Water Molecules with Fewer than Four Neighbors.* Journal of Physical Chemistry Letters, 2013. **4**: p. 2565-2570.

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5. Zhang, X., X. Liu, Y. Zhong, Z. Zhou, Y. Huang, and C.Q. Sun, *Nanobubble Skin Supersolidity.* Langmuir, 2016. **32**(43): p. 11321-11327.