

Physico-chemical properties of perturbed water: facts and enigmas

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ABSTRACT

Background

The study of extremely diluted and agitated substances and solutions is strictly linked with the analysis of properties of water perturbed using different systems. This study is about the determination of the physical-chemical parameters of water, after the perturbations described.

Methods

The perturbed water was obtained using the three different protocols:

- EDS (Extremely Diluted Solutions). Obtained through an iterative process of successive dilutions and agitations.
- IFW (Iteratively Filtered Water). Obtained through an iterative process of successive filtrations through sintered glass filters.
- INW (Iteratively Nafionized Water). Obtained through an iterative process of successive drying and wetting of the Nafion polymer.

The parameters under study are: electrical conductivity, $\chi / \mu\text{S cm}^{-1}$; heat of mixing with acid (HCl), $\Delta Q^{\text{mix}_{\text{HCl}}} / \text{J Kg}^{-1}$ or basic (NaOH) solutions, $\Delta Q^{\text{mix}_{\text{NaOH}}} / \text{J Kg}^{-1}$ and pH. χ increases of up to two orders of magnitude, $\Delta Q^{\text{mix}_{\text{NaOH}}} / \text{J Kg}^{-1}$ is exothermic and increases as the electrical conductivity increases, with a roughly linear trend, up to one order of magnitude. The analogous $\Delta Q^{\text{mix}_{\text{HCl}}} / \text{J Kg}^{-1}$, on the contrary, is found to be exothermic or null depending on the protocol used. For the two protocol (EDS or IFW) the pH is alkaline while for the third one (INW) is quite acid and shows a very good linear correlation with $\log \chi$. The linear correlations hint at a single cause for the variation of the three very different physical- chemical parameters.

Results and discussion

Each protocol produces water exhibiting its own peculiarities, to the point that they can be considered different, albeit with the common element of a variation of the super-molecular structure of the water solvent. These three procedures capable of affecting water can be grouped together by means of a common work hypothesis: the formation of dissipative structures. These three different perturbations, all of small entity considering the energies involved, can make the system evolve towards a new condition that is not one of equilibrium but, on the contrary, one that is far from it. The system can maintain a far from equilibrium condition by dissipating non-degraded, radiating energy from the environment.

The local order generated in these aqueous systems (aggregates of water molecules, aqueous nanostructures) is conserved or partially modified by dissipating radiant energies in the environment (dissipative structures) as typical in open systems, i.e. systems where a flux of energy and matter with the outside is possible.

The hypothesis formulated so far to explain the experiment results is the following: water is a complex liquid capable of self-organization induced by mechanical and/or electromagnetic perturbations, even of small magnitude. An entropy increase of the Universe, due to the dissipation, and a decrease due to the formation of a local order would still amount to overall increased entropy in the Universe, making the formation of the structures a spontaneous phenomenon.

The capability of such structures, when in the liquid state, to remain in a far-from-equilibrium state would be achieved through the dissipation of radiant energy found in the environment. Conversely, the system would no longer dissipate energy, naturally, after transitioning to the solid state when bulk water is removed through the drying procedure, but would otherwise keep the new state of aggregation indefinitely.

The fundamental work hypothesis is that water is capable of self-organization through the formation of aqueous nanostructures. The capability of such structures, when in the liquid state, to remain in a far-from-equilibrium state would be achieved through the dissipation of radiant energy found in the environment. Conversely, the system would no longer dissipate energy, naturally, after transitioning to the solid state when bulk water is removed through the drying procedure, but would otherwise keep the new state of aggregation indefinitely.

This an extraordinarily similar phenomenology to that found in the behavior of simple living systems such as multicellular organisms, molds and bacteria. When sufficient water is present, the far-from-equilibrium conditions remain (dissipative phase). Conversely, when water is no longer present, the structures linger in a quiescence condition with no dissipation taking place. When the mutated environmental conditions allow, i.e. sufficient water is available, they start to dissipate again, i.e. to “live”, in order to keep in a state far from the equilibrium. The parallel between organized water (clusters, aggregates of water molecules, aqueous nanostructures and dissipative structures) and the simpler living systems might seem exaggerated at first, but actually, to an extent, the phenomenologies are very comparable.

In the solid phase, instead, these nanostructures can keep their properties indefinitely without dissipation. They're able to go back to far-from-equilibrium conditions when sufficient water is made available again though, by exploiting radiating energies from the environment (dissipative structures).

The nature of these structures in the solid phase is currently under speculation and experimental scrutiny especially making use of in the IR spectroscopy technique.

From data gathered so far, it is possible to state that the existence of aqueous nanostructures in the solid phase emerges as a novel and totally unexpected phenomenon, and also worth of note is the exceptional similitude between the IR and UV-Vis spectra produced by water perturbed with the three diverse preparation protocols. Though it is worth underlining that some extraordinary differences of behavior do exist among the products of the different preparation procedures, which is of course a testament to the existence of many possible developments and forthcoming research activities.

With a bit of optimism one could affirm that the starting point chosen and the preparation technique could affect the shapes and dimensions of the nanostructures, giving rise to the differences in experimental behaviours. In closing, it is not to be excluded that the peculiarities of these modified waters might play a role in biological systems.

Conclusions

The most logical conclusion of these observations is that, for instance, in the EDS therapeutic properties get recorded in aggregates of water molecules, that continue to exist in the solid state as well, whose shapes and sizes, in addition to their concentration, would be responsible for the specific therapeutic effects. It is now possible to perform a further deduction, supported by the experimental results on the existence of aggregates of water molecules in the solid state at room temperature and pressure, on the mechanisms through which globules and granules exert their effect. Scientific support to this form of remedies would stem from their preparation procedure: the evaporation of bulk water would leave within the granules aggregates of water, in the solid state, whose shape and sizes would be responsible for the therapeutic effect. By dissolving the globules or granules in her mouth, the patient would lead the aggregates to the liquid phase, enabling them to dissipate again the energies from the environment in order to remain in a far-from-equilibrium condition. They would exert their therapeutic action in the form of dissipative structures. The nearly unlimited durability of the globules as a remedy would lie in the extraordinary stability of the aggregates in the solid phase.

Keywords: water, aqueous nanostructures, dissipative structures, EDS (Extremely Diluted Solutions), IFW (Iteratively Filtered Water), INW (Iteratively Nafionized Water)



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