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Review Article

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Thoughts on the Importance of Amorphous Water in Biology

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Abstract
Water, with its diverse morphological phenomena and thus the most diverse physical properties, attracts a lot of attention in everyday scientific life. Constantly new discoveries expand the understanding of this seemingly simple connection. The state of amorphous water can be seen as a special feature. Its occurrence in apparently contradicting places should give rise to a hypothetical representation in order to record possible connections.

Keywords: Amorphous Water, Plurality of Physical Water Properties, Development of Life

Introduction
"Water is life" as the Tuareg say. In fact, it is not just a molecule made up of two hydrogen atoms and one oxygen atom, but a fascinating group of substances. It reflects the interactions of physical forces, which, depending on morphological forms, are manifested in various dimensions with different physical properties. A hydrogen atom in the ground state and a hydrogen ion with a weak interaction enable the structures to interact. There is a resonance between the two. According to the principles of quantum mechanics, both boundary structures are involved with exactly the same proportions in the boundary state of the molecules. Yet water is inescapably linked to the viability of biological nature.

Discussion
In the everyday sense, the binding of the water molecules via hydrogen bonds according to the classification of Jeffrey with <17 kjmol is weak and can be represented as O-H ... O [7]. This means that a covalently bound hydrogen atom is connected to a free pair of electrons on another atom. It is therefore possible that, depending on the temperature behavior, structures can be lost in rapid succession and new ones built up. The structure formations and their dynamic transitions are undoubtedly still unclear in many respects. This is suggested by the multitude of theories for the cluster definition. But the build-up to clusters as a more stable structure, in which the hydrogen bridge formation has an higher bond strength, seems to be related to vibrational states. Clusters of hexagonal and tetrahedral structures have potential effects on physical properties [12]. The model of Del Giudice, based on his quantum mechanical consideration of small areas of the coherent binding of water molecules, implies that electromagnetic energy can be absorbed from outside [2]. One example is the Exclusion Zones of water in contact with organic material. This structure is highly charged and has the ability to input and output energy.

If one hypothetically considers water not only as a molecule with polar properties but as a structure, there is a deviation of the molecule as a neutral element from the structure of a hexagonal lattice with a negative charge. To bring to a one-dimensional understanding, it means to shift the levels in such a way that the charge of one level is aligned with the opposite charge of the other level. This leads to a strengthening of the cohesion and thus to a higher density.

The water structure of the exclusion zones is similar to that of ice. But the water molecules are fixed in the ice and form the highest possible number of hydrogen bonds, so that a crystal lattice is formed. Four oxygen atoms are tetrahedrally connected to the neighbors via hydrogen bonds.

Water includes an oxygen atom with "spherical protruding ends" to which two hydrogen atoms are anchored in a weak bond. As mentioned above, the hydrogen bonds contain a covalent bond and an ionic bond. This classic form of defining a hydrogen bond as an electrostatic interaction or as a covalent chemical bond will have to be expanded to include Dereka according to the team's investigations [3]. This "short strong H-bond" is characterized in that the H-bond shows features of a covalent bond. This changes the strength of the bond, the energy potential and the participation of the electrons. This has an influence on the structure of the water.

If one looks at the variants of the water structures, one finds numerous variants of the chemical and physical properties. The amorphous water, also called glazzy water, offers a very special constellation. This is a form of appearance that employs numerous teams in terms of its chemical and physical properties and provided fundamental insights [5, 9-11, 13]. It is a “state of aggregation” of water that occur both in biological systems, such as ripened seeds of plants, as well as in space [4]. With regard to its morphology, it is assumed that the water molecules are present in a disordered manner. If one assumes the experimental production of amorphous water, which can only be produced under special pressure and temperature conditions, then the question arises as to how one can explain the connection between these different occurrences.

Research into the structure and matter of the space explains the formation of water to the effect that initially only hydrogen existed [1]. Its components were a proton and an electron. Due to high pressure during the evolution of the stars, it condensed into helium atoms. In this nuclear fusion process, with increasing pressure, one carbon atom was created from three helium atoms and one oxygen atom from four helium atoms. When hydrogen and oxygen came into contact, water was formed. The physical conditions of space make it understandable that water could form as an amorphous substance [8].

Experiments based on astrophysics show that when high-density amorphous water is bombarded with energetic electrons - photons of ultraviolet light - the amorphous water changes its structure and began to flow. In this way, organic and biologically important elements such as carbon, oxygen and nitrogen could meet and form the simplest organic compounds, which could possibly be the simple building blocks of later amino acids. Another point of view shows that when high-density amorphous water is irradiated with high-energy particles and light quanta, molecules such as carbon monoxide and ammonia are split into highly reactive fragments, the radicals, metabolic processes that take place on earth under the influence of physical forces such as magnetism, gravity and electromagnetic radiation serve as the basis for the development of life in increasingly differentiated forms; from the simplest to the plurality.

The binding takes place via an overlap of the orbital. Short-range interactions of the hydrogen bonds dominate over the van-der-Waals forces. The properties of water as a solid substance and liquid water are determined by the hydrogen bonds of the water molecules. Distances smaller than the van-der-Waals, radii show a strong attractive effect of the hydrogen bond. They can be symmetrical or asymmetrical. The interpretation of a transition to the amorphous state cannot be conclusively stated despite decades of efforts. Numerous non-crystalline phase states were observed and discussed.

But how can one imagine the formation of amorphous water in biological material? In liquid water, the hydrogen bonds are broken and newly formed in rapid alternation. The prerequisite for the formation of organic compounds lies in the restructuring of the water structure, which makes it possible for this to happen Water can adapt to the changing chemical and physical requirements of the organic compounds and thus leads to the formation of complex compounds.

Coming back to Dereka’s description of the hydrogen bond, experimental investigations in connection with amino acids and their coupling to water show that, due to the high polarity, the amino acids bind as zwitterions. Thus, in the earthly material, a function in the sense of the newly discovered bond characteristic could be ascribed to them. Speculatively, amorphous water could offer a comparable approach. The question arises as to whether this type of formation of the simplest organic compounds in amorphous water develops a comparable chemical bond and thus causes the stability of these substances. The stability of matured seeds with the proportion of amorphous water would be an indication of this. Here, too, the ability to germinate is stabilized and thus protected. This stabilized ability to germinate shows itself over long periods of time, as for example archaeological finds testify.

Conversely, one could speculate that the first simple organic compounds in the dust clouds and the terrestrial amorphous water could be “conserved” until they develop into larger organic compounds in contact with planets in habitable zones in these places by absorbing energy according to chaotic laws.

Thus, a course of the development of earthly life would be conceivable, favored by the conserving effect of the amorphous water as a carrier substance

Conclusion

Due to its molecular structure, the water is able to take on various structures, which produce very variable chemical and physical properties. One form is amorphous water, which from the point of view of experimental research appears to be an isolated phenomenon, but scientific observations indicate that this appearance of water could be of fundamental importance. The presentation put up for discussion may be interpreted as hypothetical or even speculative. But it makes sense to look for conclusive answers from the point of view of interdisciplinary thinking.

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