

BICARBONATE AQUEOUS SYSTEMS EXHIBIT SUSTAINED NON-EQUILIBRIUM STATE AND DISPLAY SENSITIVITY TO COSMIC EVENTS.

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Bicarbonate, carbonic acid and CO₂ are present in different and dynamically changing ratios in natural waters including all biological liquids. Carbonates play essential regulatory and bioenergetic roles in major vital processes in living organisms as well as in various ecological processes. In particular reduction of carbonates contents in internal milieu of an organism below a certain threshold results in violation of cellular respiration. Many significant properties of natural aqueous systems, in particular, their self-clarifying property are related to the presence of carbonates in them. Generally it is considered that effects of carbonates are caused by their action on acid-base balance in water, however it turns out that their mechanism of action may be more specific. It may be related to their participation in free radical and other reactions going on in aqueous systems in which reactive oxygen species (ROS) take part.

Using an ESR probe tiron we demonstrated that superoxide radicals are spontaneously generated in bicarbonate solutions. Intensity of their generation is increased when solutions are illuminated. Addition of Fe(II) salts in micromolar concentration into bicarbonate solutions is accompanied with the development of a photon emission wave indicating of the presence of ROS and carbonate free radicals in bicarbonate solutions. Addition of H₂O₂ in submillimolar concentration to bicarbonate solutions results in the appearance of stable luminescence of solution in the presence of luminol. Photon emission from activated bicarbonate solutions hermetically closed and kept in darkness may last for many months. Moon and Sun eclipses, change of Moon phases dramatically affect patterns of the processes in which energy of electronic excitation is generated in aqueous bicarbonate solutions.

Incessant generation of ROS and carbonate radicals in bicarbonate aqueous systems, extremely long photon emission from such systems activated with H₂O₂, indicate that carbonate waters reside in the stable non-equilibrium state. This state implies that such aqueous systems are spatially and dynamically structured. This property of bicarbonate aqueous systems provides for their high sensitivity to the action of external ultra-weak factors if such factors are of oscillatory nature and may influence oscillatory physical-chemical processes going on in bicarbonate aqueous systems through the principle of resonance. Support of stable non-equilibrium state of aqueous systems for extremely prolonged periods of time needs continuous supply of energy from the environment. As it follows from G.H. Pollack et al. studies of aqueous systems at least two aqueous phases are present in all of them, and they are oppositely charged. Sustained charge separation in aqueous systems is related to their ability to suck low density and high entropy energy from the environment, in particular heat energy and transform it into high density and high quality low entropy energy. In aqueous bicarbonate solutions this energy may be converted into free energy of electronic excitations that may pump chemical reactions. Thus aqueous systems in particular carbonate aqueous systems exhibit the properties of step-up energy transformers, energy fluxes organizers, "negentropy transformers".

The mechanism of long-lasting effects of Sun and Moon eclipses on photon emission from aqueous systems at this point can be considered only hypothetically. Both events represent special cases of gravitational influence upon the Earth. It is clear that the direct effect of variations of the gravitation upon water samples is practically negligible. However the effect on such a massive body as the Earth may result in the changes of the parameters of manifold physical fields associated with this body and their variations may trigger changes in the behavior of non-equilibrium aqueous systems. It should be noted that the cosmic events may influence the behavior of practically all non-equilibrium carbonate containing aqueous systems on the Earth including water in living organisms and cause long-lasting effects in them.