

Aquaphotomics: VIS-Near Infrared Spectrum of Water as Biological Marker

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Aquaphotomics (“all about water – light interaction”) is a new term, introduced to describe an area of science dedicated to enhance our understanding of water-light interaction at every frequency of the electromagnetic spectrum. In particular, VIS/NIR spectroscopy is considered as a new tool for water observation that provides enormous information about water at molecular level and therefore, a better understanding of biological world. NIR light allows a penetration pathlength of up to 10 mm in water and for the short wavelength region (750–1098 nm) it is even longer. Therefore, every absorbance spectrum of water solutions or biological systems contains information with “one hydrogen bond” resolution. Numerous such spectra can be obtained non-invasively over time and under various perturbations while observing a biological system. Water, as a natural biological matrix containing only small molecules with a strong potential for hydrogen bonding, changes its absorbance pattern every time it adapts to physical or chemical change in biological systems or the environment. Therefore, its spectral changes permit measurement of small quantities or of structural changes in other molecules in the system. In other words, adding NIR light to visible light adds a new dimension to the water mirror effect. Water becomes a “stereo”, 3D mirror as, in addition to the reflection of the visible light, every frequency of the NIR light penetrates into the water and gets absorbed by each individual hydrogen bond in a unique way.