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Helices of ordered hydrogen bonds in liquid water as monostable protonic multivibrators

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The model of hydrogen-bond helices, $(\text{H}_2\text{O})_n$, is built in for the liquid-water density fluctuations. This model allows providing the high quantity of tetrahedral hydrogen bonds in the non-ordered liquid matrix and explaining the density anomaly of liquid water. The topology of helical clusters of dense water part is differed from the one for the crystalline ice. From this and only this point of view, the liquid water can be considered as the two-structural liquid because the formation and decay of such the clusters has dynamic character and is natural consequence of water density fluctuations. The other key feature of these clusters with ordered hydrogen bonds in helices, $(\text{H}_2\text{O})_n$, is the coherent protonic vibrations of resonator frequencies, f_n , in terahertz range. The spectral series of such the resonances is defined in. On the other hand in, the liquid water is considered in the frame of electronic band theory with accentuating the guessed energy levels, $\epsilon_{\text{H}_2\text{O}}$ and ϵ_{OH^-} in the band gap for inherent constituents H_3OOH of liquid water as hydroxonium and hydroxide ions (H_3O^+ , OH^-). Their radicals (H_3O , OH) are interpreted as electron and hole population of the corresponding levels located symmetrically near by the middle of the band gap with $\epsilon_{\text{H}_3\text{O}} - \epsilon_{\text{OH}} = 1.75$ eV. H_3OOH . The hydroxonium and hydroxide ions can be ends of the ordered hydrogen-bond helices as $\text{H}^+(\text{H}_2\text{O})_{n-1}\text{OH}^-$. Such the helices of ordered hydrogen bonds are considered as protonic multi-vibrators in a stable charged state with the electric potential of 1.75 V. These multivibrators can be switched on oscillation state in the electromagnetic field of resonance frequencies, f_n , by synchronic regrouping hydrogen bonds in the helices: $\text{H}^+(\text{H}_2\text{O})_{n-1}\text{OH}^- \leftrightarrow (\text{H}_2\text{O})_n$.

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Crystal growth and physicochemical properties of dichloro bis L-valine zinc (II) (DCBVZ) semi-organic single crystal

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Semi-organic nonlinear optical single crystal dichloro bis L-valine zinc (II) (DCBVZ) was synthesized and successfully grown by the slow evaporation solution growth method. The structural, thermal, optical and mechanical properties were studied for the grown crystal. Cell parameters were determined using X-ray diffraction studies. FT-IR and NMR spectral studies confirm the functional groups present in the title material. The optical properties such as optical band gap and UV cut-off wavelength of the title material were obtained from the UV-vis-NIR spectrum. The thermal stability of the crystal has been analysed using TG/DTA studies. Vickers micro hardness studies were carried out to understand the mechanical properties of the grown crystal. From the experimental study of nonlinear optics by Kurtz and Perry powder technique, the SHG conversion efficiency of DCBVZ crystal is found to be 1.2 times larger than that of KDP.

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