

Deviation from identity of macroscopic properties of enantiomers –via water chiral preference

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The parity violation energy difference (PVED) between chiral isomers is of a tiny magnitude ($<kT$) which, in principle, can be expanded to a macroscopic detectable level under cooperative processes¹⁻³. Recently, a series of findings have suggested that the hydration layers around chiral amino acids in water may differ for the enantiomers^{3,4}, which could support macroscopic chiral discrimination in rates of crystallization⁵ and heat of solution⁴. Furthermore, for poly amino acids in water differences between L and D poly glutamic acid were observed in helix coil transition⁶, as well as in thermal stability and supra molecular structures⁷. Surprisingly, when tested in D₂O under identical conditions these differences were markedly reduced^{6,8}, indicating a specific discrimination of H₂O molecules between chiral configurations. It has been proposed^{3,6,8} that the spin isomers of water, i.e. ortho H₂O and para H₂O, prevailing at a 3:1 ratio respectively⁹, could account, at least in part, for this discriminatory power. In D₂O the spin isomers are much less pronounced⁹ which may greatly attenuate such a putative chiral preference^{6,8}. Chiral discrimination in water implies that partitioning of a racemic mixture into water may be followed by a transient optical activity at its initial phase. Such a yet unprecedented observation will be also presented. Together, the mentioned studies provides evidence to the assertion that water possess a chiral discriminatory power³⁻⁶, which lead to violation of chiral identity in aqueous solutions. It also provides new clues and investigation ways of water structure.

The main significance of our work is in the realm of the linkage and transfer of parity violation from level to level, beginning with the elementary particles and forces, to atoms molecules and more complicated systems, life itself ?

Our work provides the experimental proof and the explanation how this linkage is done.

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