

Deviation from identity of macroscopic properties of enantiomers – via water chiral preference. (*Is water chiral?*)

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Abstract

Mirror-image asymmetric molecules, i.e. enantiomers, are classically considered as chemically identical. Parity violation by the nuclear weak force induces a tiny energy difference between chiral isomers. Upon combination with a massive amplification process, expansion of this difference to a detectable macroscopic level may be achieved. In our studies we have proven this concept in several systems:

Stearoylserine "quasi peptide" formation

Solubility and cluster formation of Alanine

Diffusion and calorimetry of racemic alcohols

Peptide Transitions to alpha –helix, shortly described hereafter and others

We compared structural and dynamic features of synthetic D- and L-polyglutamic acid and polylysine molecules each of 24 identical residues. The helix and random coil configurations and their transition were determined in this study by circular dichroism (CD) and isothermal titration calorimetry (ITC) in water and deuterium oxide. Distinct differences in structure and transition energies between the enantiomer polypeptides were detected by both CD and ITC when dissolved in water. Intriguingly, these differences were by and large abolished in deuterium oxide. Our findings suggest that deviation from physical invariance between the D- and L-enantiomers acids is induced in part by different hydration in water which is eliminated in deuterium oxide. We suggest that ortho-H₂O, which constitutes 75% of bulk H₂O, has a preferential affinity to L-enantiomers. In other words, these studies, **prove that indeed water has chiral preferences**, Accordingly, Heavy Water has no chiral preference. Differential hydration of enantiomers may have played a role in the selection of L-amino acids by early forms of life.