PARITY VIOLATION IN CHIRAL MOLECULES: CURRENT STATUS OF THEORY AND SPECTROSCOPIC EXPERIMENT

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In the ordinary quantum chemistry based on the electromagnetic interaction the ground state energies of enantiomers of chiral molecules are exactly the same by symmetry. Parity violation in electroweak interactions leads to a small "parity violating" energy difference $\Delta_{pv}E$ between the ground states of enantiomers corresponding to a heat of reaction for stereomutation $\Delta_{\mathrm{R}}\mathrm{H}_0^{\ominus} \simeq 10^{-11}$ J mol^{-1}, (typically, or about 100 aeV corresponding to about 10^{-12} cm^{-1}). After our finding (in 1995) that a revised theory leads to about a factor of 10 to 100 higher values than previously calculated in older theoretical work prior to 1995, the theoretical results from many groups have now essentially converged to the new values (see reviews [a] [b] [c]). However, experimental results for $\Delta_{pv}E$ are still missing. We shall discuss the status of ongoing experiments in the Zürich group to detect this exceedingly small effect by spectroscopy following a scheme proposed in 1986 [d] [e] and shall discuss also the comparison with other efforts.

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