

Postdoc positions are available in our group at the Laboratory of Physical Chemistry of ETH Zurich

PROJECT: Experimental determination of the parity violating energy difference between enantiomers of chiral molecules

Background and goals: According to ordinary quantum chemistry including only the electromagnetic force, the ground state energies of the enantiomers of chiral molecules would be exactly identical by symmetry, as would also all symmetrically equivalent excited energy levels. Including parity violation in 'electroweak quantum chemistry' derived from the Standard Model of Particle Physics (SMPP) we predict a measurable energy difference D between the enantiomers on the order of 100 Atto-Electron Volt to 1 Femto-Electron-Volt (or 0.1 to 1 feV) for typical chiral molecules involving only the lighter elements. This energy difference has so far never been measured and its determination is of fundamental interest for tests of current theories for chiral molecules as well as for testing certain aspects of the SMPP by precision experiments. In a current laser spectroscopic experiment on molecular beams in our laboratory, $\Delta_{pv}E$ can in principle be measured in a scheme involving the detection of the change of parity with time in isolated molecules. We have demonstrated this experimental approach with tests on the achiral molecule ammonia. Advanced spectroscopic experiments and analyses are needed now to extend the experiment to chiral molecules in order to determine $\Delta_{pv}E$. Postdocs with experience in high resolution molecular spectroscopy and spectroscopic analyses as well as in laser and molecular beam experiments are most welcome to join our team in this fundamental and very challenging effort

APPLICANTS with a Ph. D. degree in molecular physics or physical chemistry with experience in either precision laser spectroscopic and molecular beam experiments (including REMPI detection) or analyses of very high resolution IR-spectra and experimental FTIR spectroscopy (possibly synchrotron based) should send a letter with copies of the relevant documents, a cv and list of publications as well as one or two letters of recommendation to Martin Quack at the address below. A good team spirit, the ability to work independently in demanding experiments and enthusiasm for the fundamental science in this challenging project are essential.

Background reading can be found for download on our website given below (see in particular handbook article of Martin Quack 2011 and the papers under latest news on the front page)

CONDITIONS: At present, all positions are occupied. However, if you have funding of your own, you might join the project. In this case contact Prof. M. Quack

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