Spectroscopy, Quantum Dynamics and Electroweak Parity Violation in Chiral Molecules

Fact Sheet

Project Information

SPEQUACHIRAL2

Grant agreement ID: 290925

Project closed

Start date
1 December 2011

End date
30 November 2015

Funded under
Specific programme: "Ideas" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

Total cost
€ 1 579 600,00

EU contribution
€ 1 579 600,00

Coordinated by
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH
Switzerland

Objective

The PI and his group have in theoretical and preparatory experimental efforts approached one of the most fundamental questions of molecular physics, concerning

the role of parity violation in chiral molecules, with consequences for physical stereochemistry. The traditional point of view assigns exactly equal ground state energies to the enantiomers of chiral molecules. However, with the discovery of parity violation in physics we expect a small “parity violating” energy difference D, corresponding to an in principle measurable reaction enthalpy. Because D is expected typically in the subfemto eV range these energies were in the past considered to be immeasurably small. Recent theoretical and experimental progress initiated by our group has led to order of magnitude larger predicted values for D and has also made rovibrational line assignment of optical spectra of chiral molecules possible (Quack, Stohner, Willeke, Ann. Revs. Phys. Chem. 2008). Thus the outlook to carry out successful experiments on D is now good, following a scheme previously published by us. The present proposal describes in detail several logical steps for these experiments.
1. Theoretical analysis and high resolution spectroscopy of selected chiral molecules.
2. Quantum tunneling dynamics from spectroscopy to identify appropriate quantum states for the experiment.
3. Preparation of superposition states of otherwise stable R and S enantiomer quantum levels to generate “parity isomer” states (never before prepared)
4. Spectroscopic observation of the time dependent change of the parity isomer spectra resulting in a first determination of the parity violating D in chiral molecules.
We also discuss the feasibility and the outlook to gain fundamentally new knowledge.

Fields of science (EuroSciVoc)

natural sciences > physical sciences > **molecular and chemical physics**

natural sciences > physical sciences > optics > **spectroscopy**

Programme(s)

FP7-IDEAS-ERC - Specific programme: "Ideas" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

Topic(s)

ERC-AG-PE4 - ERC Advanced Grant - Physical and Analytical Chemical sciences

Call for proposal

ERC-2011-ADG_20110209
See other projects for this call

Funding Scheme

ERC-AG - ERC Advanced Grant

Host institution

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH

EU contribution

€ 1 579 600,00

Total cost

No data

Address

Raemistrasse 101
8092 Zuerich
Switzerland

Region

Schweiz/Suisse/Svizzera > Zürich > Zürich

Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

Beneficiaries (1)

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH

Switzerland

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Last update: 6 June 2016

Permalink: https://cordis.europa.eu/project/id/290925