

The Quantum Dynamics of Chiral and Achiral Molecules: From High Resolution Spectroscopy Towards Fundamental Symmetries and Asymmetries

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Symmetry and asymmetry are concepts, which are used in a wide range of contexts, from the fundamental sciences, mathematics, physics, chemistry and biology to the arts, music and architecture [1]. We shall start with an introductory outline of how symmetries can be applied to the understanding of the time scales in fundamental kinetic primary processes. We then briefly discuss our approach to derive molecular quantum dynamics from high resolution spectroscopy. We shall present some selected examples from our recent research including results on intramolecular energy flow, molecular tunneling and tunneling switching phenomena as well as a report on current progress towards the observation of the theoretically predicted, new process of parity change with time in isolated chiral molecules, which connects the principles of high energy physics with molecular chemical kinetics and potentially the evolution of biomolecular homochirality. For background reading and some recent results see [1-10].

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