

Electrodynamics of Ultrafast Energy Transfer Processes in Clusters of Real and Artificial Atoms Induced by Long-Range Electron Correlation

Initiative: Freigeist-Fellowships

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Laufzeit: 5 Jahre

Projekt-Website: <https://hz-b.de/theochem>

Electrons located in different atoms are correlated over astonishingly long distances: assuming them to be as tall as humans this distance compares to that from earth to moon. Their long-range correlation results in ultrafast energy transfer processes in which, for example, the electron in an excited atom relaxes while a neighboring atom emits an electron. Accurate electrodynamics calculations supplemented with creative approaches for the intriguing treatment of many-electron atoms will open up new horizons for the physical insight into this family of state-of-the-art processes. By considering nano-structured semiconductor quantum dots, the so-called artificial atoms, as sites for the electrons, a pioneering research field at the coalescence point of solid state physics, nano-material science, and theoretical chemistry has been established. Its major aspect is the theoretical exploration of the full portfolio of conceivable energy transfer processes in various technologically relevant quantum dot architectures. Any experimental proof would be groundbreaking and leading to cutting-edge quantum dot applications as photodetectors or solar cells.

Projektbeteiligte

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JELLYFISH: a modular code for wave function-based electron dynamics simulations and visualizations on traditional and quantum compute architectures

A Quantum-compute Algorithm for the Exact Laser-driven Electron Dynamics in Molecules