

Coherent Quantum Processes in Thermal and Nonequilibrium Environments

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In this talk, we describe recent work on investigating the role of the environment in influencing coherent quantum dynamics. We describe numerical methodology for simulating quantum coherent processes using classical-like molecular dynamics simulation and ensemble averaging, and apply the approach to simulating vibrational dephasing of I_2 in cryogenic rare gas matrices and the quantum vibrations of OH stretches of HOD in D_2O . We then describe simple analytic and numerical models that highlight novel behavior that can be exhibited by quantum coherent processes in the presence of an environment that is not at thermal equilibrium. We finish with some speculations on the role of nonequilibrium bath effects in quantum biological processes.