Quantum Efficiency Seminar und Colloquium

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On the relation of kinetic rates, vibrational coherences and quantum efficiency in ultrafast photo-isomerization reactions

Photo-isomerization reactions occur on sub-nanosecond time scales and are at the basis of a large variety of optoelectronic switching schemes, light-assisted chemical reactions, and biophysical assays. They form also the primary step in key biological processes such as bacterial photosynthesis, photo-taxis and vision. Indeed, the visual receptor protein rhodopsin, and its photosensitive chromophore retinal, display one of the fastest and most efficient photo-isomerization processes known in Nature. Reproducing the < 200 fs reaction time and >60% reaction yield is a formidable challenge for material scientists, theoretical chemists and physicists alike, as it requires a deep understanding of the ultrafast photophysics of these systems.

We will present in this talk our most recent results obtained on biomimetic molecular switches [1-3], and on a new form of retinal proteins, the Anabaena Sensory Rhodopsin. Both systems question the still widespread belief, based on the Landau-Zener relation, that higher kinetic rates necessarily imply an increased quantum yield.