Quantum Control of Femtochemistry in the Gas Phase, Liquid Phase and on Surfaces

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Ever since their invention lasers were considered as the ideal tool for microscopic control of cleavage and formation of chemical bonds. In femtosecond quantum control , selectivity over photoinduced reactions is achieved by exploiting the ultrashort time scales and the coherence properties of fs - laser radiation. In combination with a learning algorithm which processes experimental feedback to adaptively find optimized electric field shapes best suited for solving the control task, chemical reactions can even be steered into a desired direction without a priori knowledge about the reaction mechanism.

The experiments represent a first step and a new reaction path towards laser-induced catalysis of molecular systems, further improved by the benefits of femtosecond laser pulses tailored especially for a desired outcome.