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Quantum analysis and design of laser pulses for control of chemical reactions

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An important topic in femtosecond chemistry is control of chemical reactions by means of laser pulses. I shall present recent progresses for the corresponding quantum analysis and design of efficient laser pulses applied to six model systems:

1. Optimal control of selective ionization versus bond breaking in an organometallic compound $CpMn(CO)_3$ [1]
2. Selective preparation of pure enantiomers from an oriented racemate [2], see also [3]
3. Symmetry breaking in FHF^- with directed separation of products F+HF [4]
4. Control of vibrational momenta for selective bond breaking in HOD [5]
5. Control of torsional angular momenta for quantum ignition of a molecular propeller [6]
6. Quantum ignition of uni-directional electron ring currents and cyclic electron transfer in Mg-porphyrin [7]

The laser driven molecular quantum dynamics will be demonstrated by films showing the time evolution of corresponding molecular nuclear (1-5) and electronic (6) wavepackets.

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