COHERENT CONTROL IN MOLECULES BY LIGHT-INDUCED POTENTIALS

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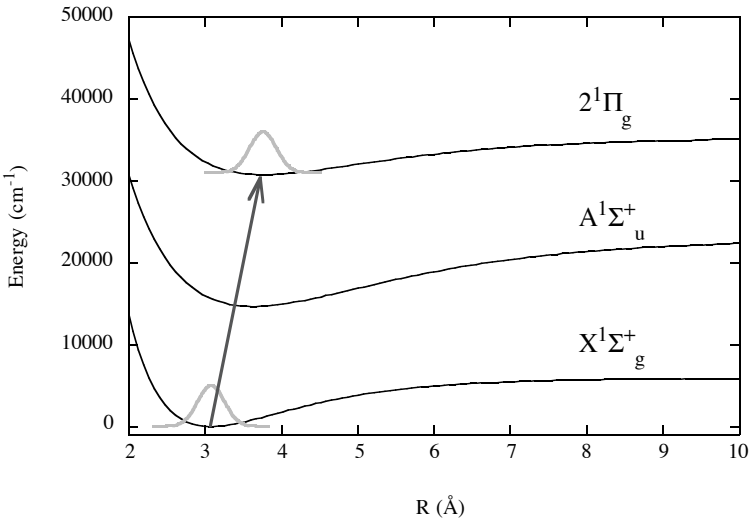

We present the APLIP process [1] (Adiabatic Passage by Light Induced Potentials) for the adiabatic transfer of a wave packet from one molecular potential to the displaced ground vibrational state of another. We use Na_2 as our example (see the figure). The process uses an intermediate state, which is only slightly populated, and a counterintuitive sequence of light pulses to couple the three molecular states. APLIP shares many features with STIRAP (stimulated Raman adiabatic passage) [2], such as high efficiency and insensitivity to pulse parameters. However, in APLIP the main mechanism for the transport of the wave packet is a light induced potential. The process appears to violate the Franck-Condon principle, because of the displacement of the wave packet. In fact it takes place on timescales which are at least a little longer than a vibrational timescale. The wave packet dynamics description of APLIP is not limited to molecules, but should also be applicable to atoms and Bose condensates in external potentials.

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