COHERENT EFFECTS INVOLVING THE EXCITATION AND RELAXATION OF THE COUPLED L_a/L_b ELECTRONIC EXCITED STATES OF NAPHTHALENE: A TIME DEPENDENT EXPERIMENTAL STUDY

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The ultrafast dynamics of the non-adiabatic coupling between the $L_a(S_2)$/$L_b(S_1)$ electronic excited states of naphthalene has been investigated, regarding the coherent aspects of the preparation and subsequent relaxation of the system. This electronic coupling represents a well known case of non-adiabatic behavior that has been used for years as a benchmark to test theoretical models. The jet cooled naphthalene molecule was prepared in the L_a and L_b states by femtosecond pump pulses in the UV region (318-268 nm), while the temporal evolution of the system was tracked by multiphoton ionization of the molecule with probe pulses centered at 800 nm. The time dependent signals collected at excitation wavelengths corresponding to the weak S_0-L_b transition are dominated by the CPR (Coherent Population Transfer) effect induced by the blue-shifted stronger S_0-L_a absorption. The CPR effect results in the transient population of the L_a state during the interaction of the pump pulse with the system, revealing the coherent nature of the excitation process. The transients collected after excitation to the L_a state reveal the ultrafast relaxation to the strongly coupled L_b state. The electronic and/or vibrational nature of the periodic recurrences observed along the relaxation of the electronic population will be discussed.