

Project KBN: The investigation of artifacts in transient absorption measurements on the femtosecond time scale; 2000-2001

We derived an analytical formula for the temporal instrumental function in femtosecond transient absorption studies that takes into account the temporal broadening due to the group velocity dispersion in the sample cell and the absorbance of the pump pulse intensity (Appl. Phys. B, **72** (2001) 843). The laser pulses of different wavelengths propagate with different velocities through the sample that causes their temporal mismatch. The broadening of the instrumental function depends on the difference between the pump and probe wavelength, sample thickness and dispersion of the refractive index of the sample material (solvent in the case of studies in solution). Not taking into account this effect might cause severe distortions in the time constants of the measured processes or reactions. The extreme (but not unreal!) example is shown in Fig. 1 for the 2 mm sample cell with carbon disulfide and pump pulses of about 100 fs at 400 nm. As can be seen, the temporal broadening is substantial and varies significantly with the probe wavelength while the fit (solid lines) of the calculated function is very good. The relatively simple analytical formula derived by the applicant is especially useful in fitting procedures when the instrumental function is convoluted with the model functions (usually multiexponential).

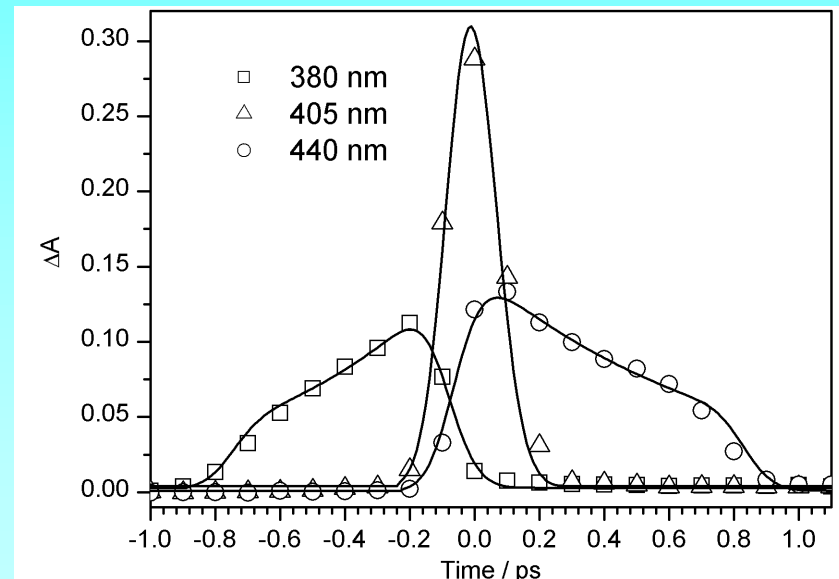


Fig. 1. Two-photon absorption signal measured in 2 mm sample cell filled with CS_2 for different probe wavelengths (pump wavelength of about 100 fs duration is centered at 400 nm).