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General Research Goal: Characterization of NLO materials.

PHOTODEGRADATION:

The photodegradation of non-linear optical chromophores in electro-optic polymers is determined using excitation at 1.55 μm , the C-band employed in telecommunications. Photostability figures of merit are determined that allow for calculation of anticipated device lifetimes. The dependence of the figure of merit on molecular architecture, presence of well-known oxygen quenchers, and variations of the polymeric host are determined. Finally, the chromophore photobleaching kinetics determined here demonstrate that longer data acquisition times than previously reported in the literature are required to fully capture the photodecomposition kinetics.

HYPER-RAYLEIGH SCATTERING:

Characterizing the microscopic nonlinear optical properties of organic charge-transfer chromophores is critical to predicting the macroscopic behavior and overall efficiency of these materials in a wide range of electro-optic devices. Hyper-Rayleigh scattering (HRS), provides a means of quantifying the 1st order hyperpolarizability (β) of electro-optic chromophores. In our HRS experiments, a tunable femtosecond Ti:sapphire laser system, equipped with a synchronously pumped optical parametric oscillator, provides accessible wavelengths from 720 nm to 2.2 microns. This frequency agility allows for the hyper-Rayleigh measurement of hyper-Rayleigh cross sections at a variety of frequencies in contrast to the single-valued HRS intensities usually reported. Lastly, there is a large discrepancy in the literature regarding the reported β_{CHCl_3} values. In order to determine a more accurate β_{CHCl_3} value, we will use the system described above to measure the absolute solvent HRS cross sections (σ_{HRS}) using an integrating-cavity technique.