1.11 Luminescence Phenomena in Organic Single Crystals

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To optimize the nonlinear optical properties of organic crystals it is of importance to understand the nonlinear response of the molecules itself and the influence of the crystal packing and the intermolecular interactions on the molecular response. By performing absorption and luminescence spectroscopic measurements we are able to better understand the processes which determine the nonlinear optic effects of organic crystals. From this knowledge we expect to be able to develop new organic crystals with improved properties more efficiently.

Among our newly synthesized organic crystals for nonlinear and electro-optic applications some co-crystal derivatives based on merocyanine dye and some stilbazolium salts show a strong luminescence emission in the visible when illuminated in the near infrared. With the availability of high quality DAST absorption and first luminescence measurements have been performed. With our DAST crystals two luminescence bands have been observed. Luminescence maxima have been measured at 628 nm and 705 nm respectively (with band widths (FWHM) around 100 nm) for an excitation at $\lambda = 1.064$ μm. For different excitation wavelengths the positions of the emission maxima are shifted; as an example the luminescence maxima appear at 580 nm and 720 nm for an excitation at $\lambda = 532$ nm.

Further measurements to identify the underlying physical processes are in progress.