Supporting Information for

Revisiting the laser dye Styryl-13 as a reference near-infrared fluorophor: implications for the quantum yields of semiconducting single-walled carbon nanotubes

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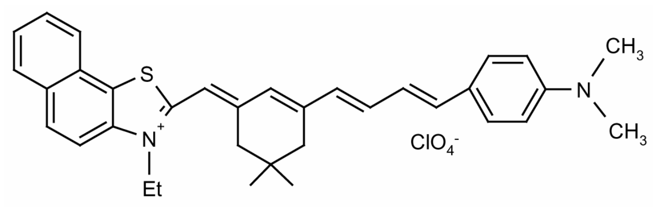
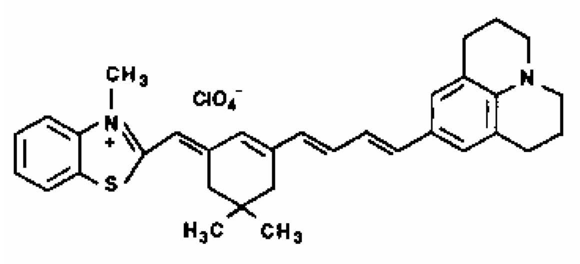


Styryl-13 (LDS 925): 2-[p-dimethylaminophenyl)-2,4-neopentylene-1,3,5,7-octatetraenyl]-3-ethyl-(6,7-benzo)-benzothiazolium perchlorate



Styryl-20 (LC 9940): 2-(8-(9-(2,3,6,7-tetrahydro-1H,5H-benzo(i,j)chinolizinium))-2,4-neopentylene-1,3,5,7-octatetraenyl)-3-methylbenzothiazolium perchlorate

Figure S1. Structures and nomenclature for the near-infrared laser dyes used in this work.

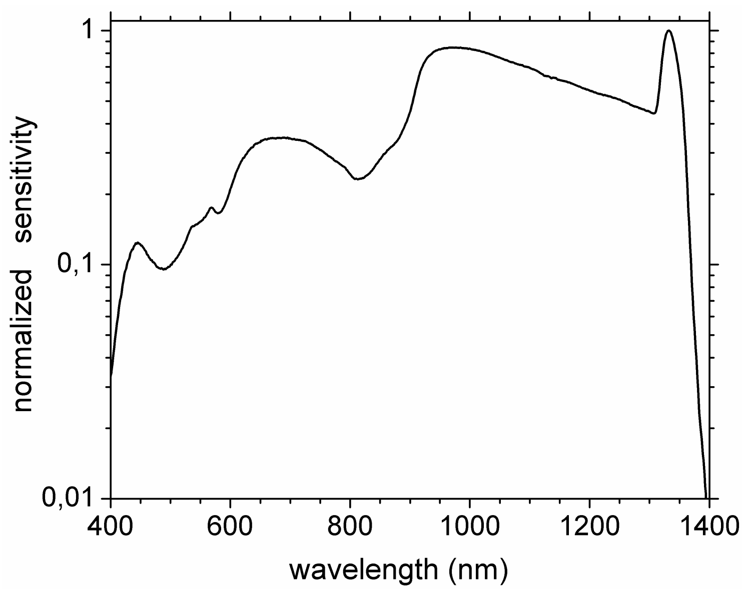


Figure S2. Normalized spectral response for unpolarized light (sensitivity) as determined for the Fluorolog-3 spectrometer used in this study. The same curves were obtained for emission monochromator slit widths of 3, 5 and 8 nm. The response is proportional to the detector signal per incoming photons per wavelength interval. The correction of emission spectra for spectrometer response is especially accurate in the range ~430-1380 nm, where the sensitivity only varies by a factor of 10.

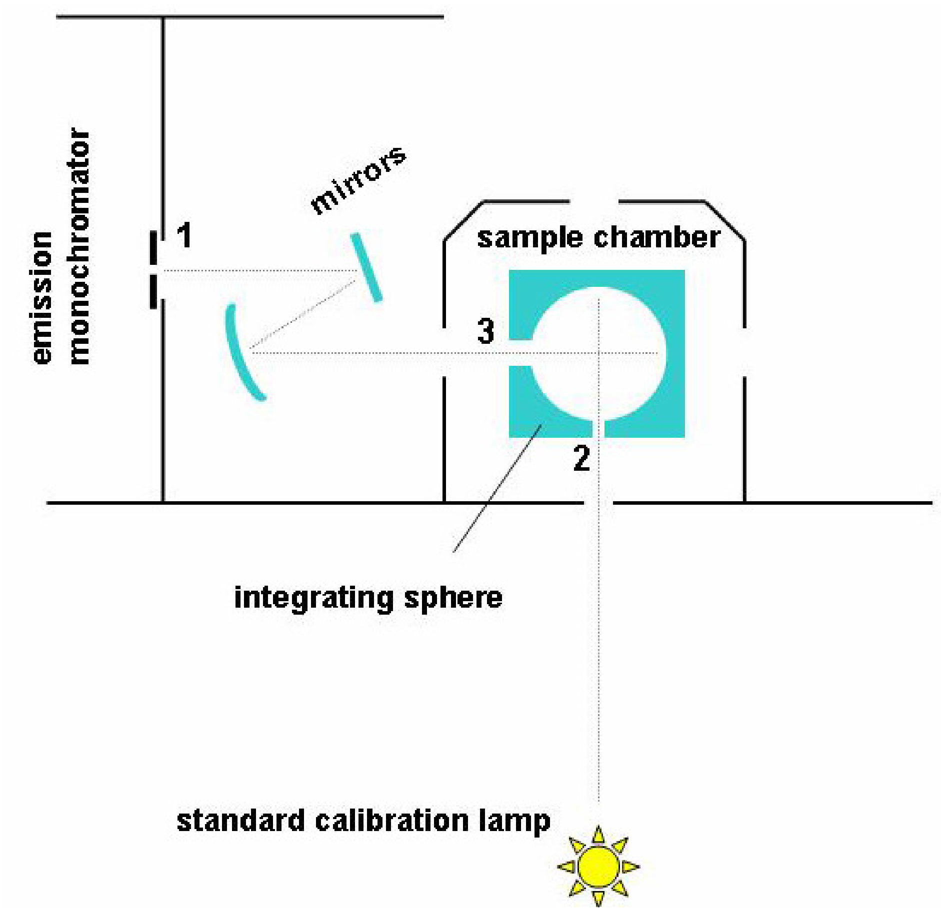


Figure S3. Schematic layout for the calibration of the wavelength-dependent response of a photoluminescence spectrometer/ detector, illustrated here for the Fluorolog-3 spectrometer. A standard NIST traceable tungsten halogen lamp is used as a light source with a known spectral radiance. An integrating sphere is placed in a sample chamber for reducing the light intensity on the monochromator entrance slit (1). The reduction factor can be adjusted by varying the distance between the lamp and spectrometer as well as the entrance (2) and exit (3) apertures of the integrating sphere. In the operating range of the integrating sphere (~300-2500 nm for Spectralon® material), this factor is practically independent of the wavelength. We recommend to keep the exit aperture (3) relatively large in order to provide for a uniform illumination of the slit (1) – as in a typical fluorescence experiment with solutions. The use of too small an aperture may result in errors to the calibration functions due to a different distribution of light across the photodetector (which may have a spatially non-uniform response).

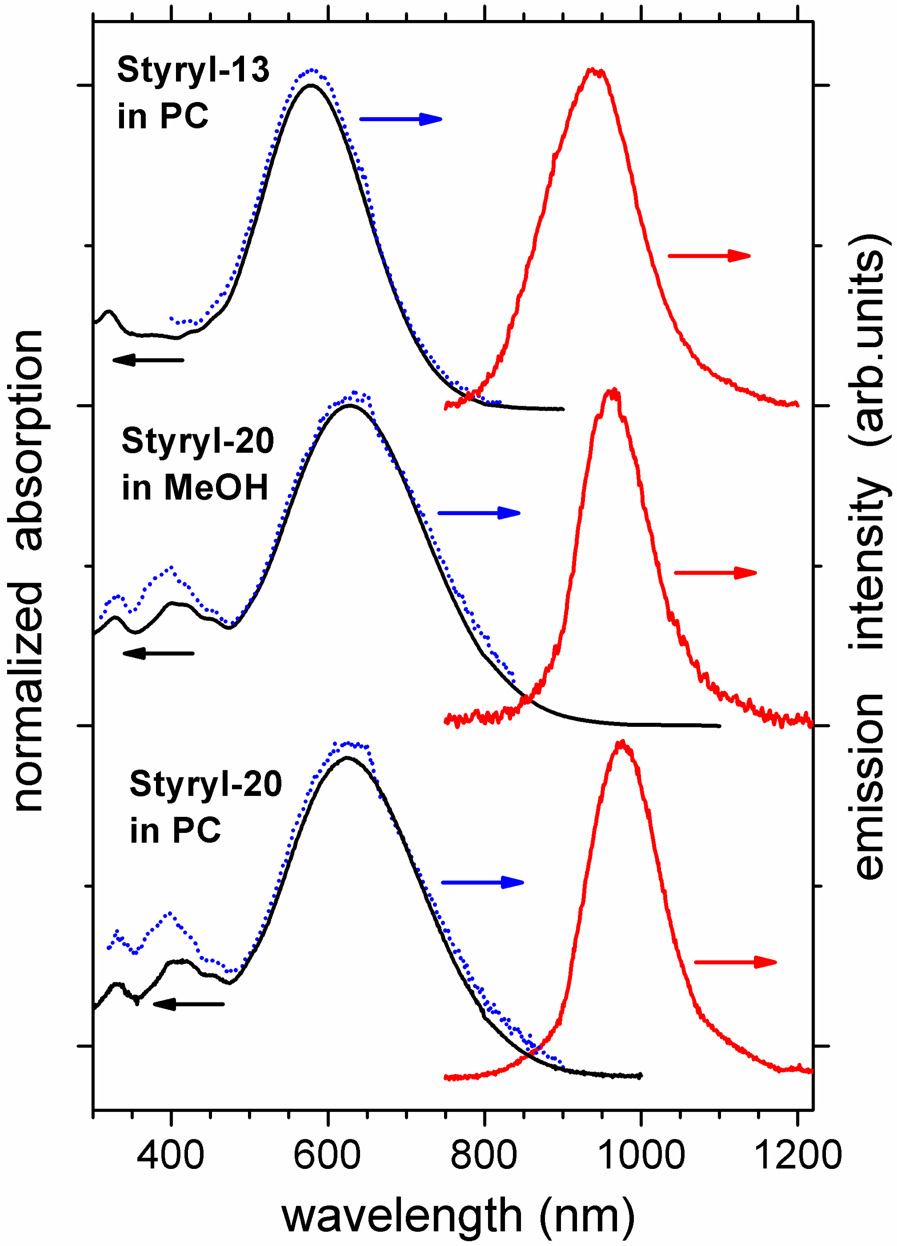


Figure S4. Absorption and fluorescence spectra of Styryl-13 in propylene carbonate and Styryl-20 in methanol and propylene carbonate. The emission was recorded at an excitation wavelength of 527 nm and corrected for wavelength-dependent spectrometer response. The fluorescence excitation spectra (dotted blue lines) were acquired at emission wavelengths corresponding to the emission maxima of the dyes (941, 960 and 978 nm for Styryl-13 in propylene carbonate and Styryl-20 in methanol and propylene carbonate, respectively).

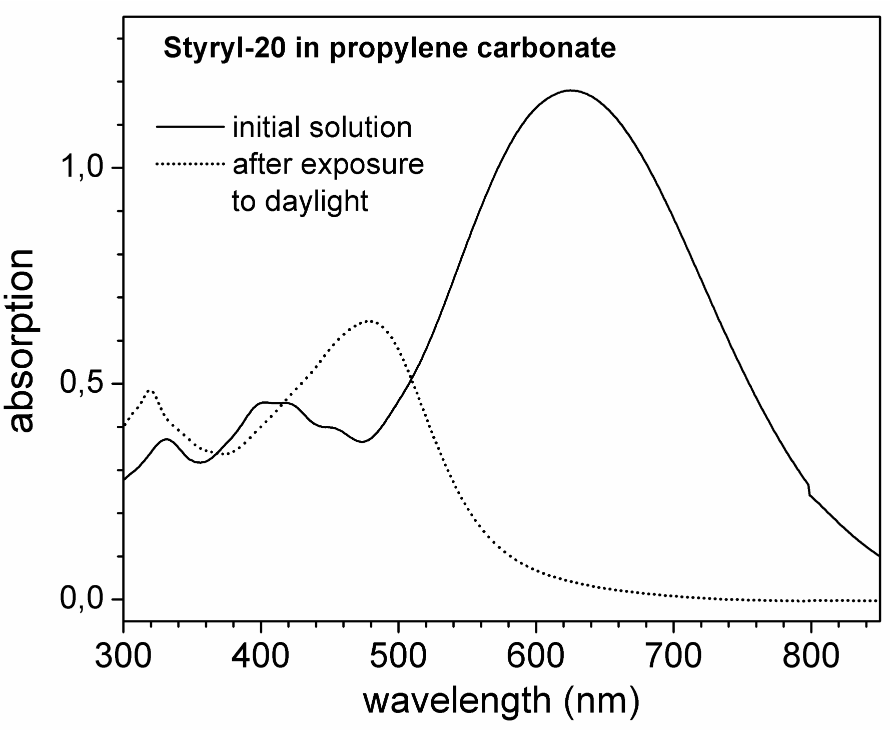


Figure S5. Absorption spectra indicate complete photodegradation of Styryl-20 dissolved in propylene carbonate upon exposure (in a 10 mm quartz cuvette) to daylight for three days. Photodegaradation products showed a weak broad fluorescence within the ~400-700 nm range.