Using Low Power LEDs for a Simple and Quick Estimation of Quantum Yields

Eduard Stadler[1], David E. Fast[1], Anna Eibel[1], Georg Gescheidt[1]

[1] *TU-Graz, Institute of Physical and Theoretical Chemistry, 8010 Graz, Austria*

E-mail: eduard.stadler@tugraz.at

Despite the recent boom of photo-induced reactions in synthetic chemistry, quantum yields can scarcely be found in the literature. This is likely due to the complicated handling of available chemical actinometers, expensive equipment and the laborious evaluation of the resulting quantum yields. In this study we investigated the scope of a setup using cost effective low-power LEDs as light sources and UV-VIS spectroscopy as the detection method of choice. The setup was tested using two different chemical actinometers: The light-induced conversion of *o*-nitrobenzaldehyde to *o*-nitrosobenzoic acid[1] and the photo-induced *E*-*Z*-isomerization of azobenzene.[2] Empirical functions were fitted to the obtained absorbance traces and differentiated at time point zero, and the amount of absorbed light was computed, and empirical functions were fitted to the obtained absorbance traces and differentiated at time point zero. With this method quantum yields can be measured with errors in the range of 10%. Furthermore we recommend suitable LEDs for actinometric measurements and present a simple way to include the effect of polychromatic light sources in the analysis.

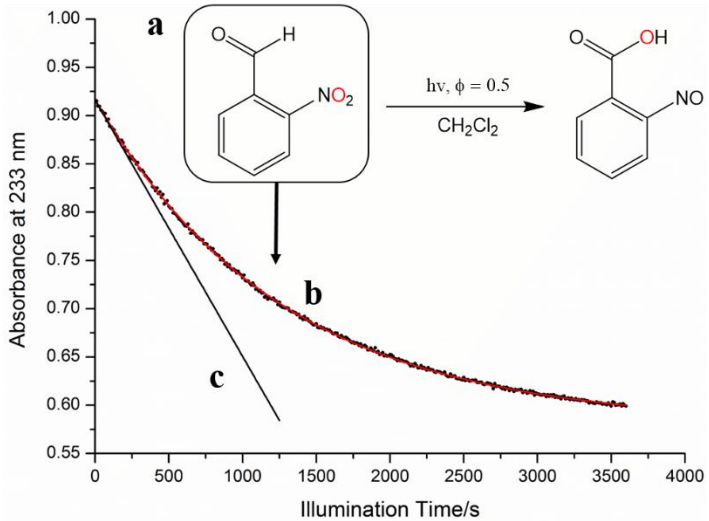

Figure 1. a) Conversion of *o*-nitrobenzaldehyde to *o*-nitrosobenzoic acid under UV-light. b) Absorbance trace (233 nm, A_{max} of *o*-nitrobenzaldehyde) obtained by in-situ irradiation with an UV-LED (black dots) and exponential fit to the absorbance data (red). c) Slope at time point zero used for the computations of light intensity or quantum yields.

References:

[1] K. L. Willett, R. A. Hites, *J. Chem. Educ.* **2000**, *77*, 900.

[2] G. Zimmerman, U. Paik, L.-Y. Chow, *J. Am. Chem. Soc.* **1958**, *80*, 3528–3531.