

Fluorescence Lifetime and Quenching in I₂ Vapor Pre-lab Handout

1 Some Lab Buzzwords

fluorescence, phosphorescence, Stern Volmer plots, (self)quenching, self quenching cross-section or impact distance(σ), natural lifetime(τ_0), photomultiplier tube(PMT), Rhodamine 6G, nitrogen dye laser

- Also make sure you are familiar with every component of figure 4 (lab manual)

2 Iodine Quenching

- $I_2^* \rightarrow I_2 + h\nu_f$ - fluorescence
- $I_2^* \rightarrow I + I$ - nonradiative decay by predissociation
- $I_2^* + I_2 \rightarrow I + I + I_2$ - collisional predissociation (bimolecular, self quenching)

3 Relevant formulas

$$I_f(t) = I_{f0}e^{-\frac{t}{\tau}}, \quad \sigma^2 = \frac{\alpha}{4} \sqrt{\frac{mk_B T}{\pi}}, \quad \frac{1}{\tau} = \frac{1}{\tau_0} + \alpha P \quad (1)$$

4 Reminders

- Don't leave the lab without: gauge calibration data and 5+ waveform transformed text files containing your data.
- Please distill all iodine back to reservoir.
- NEW!! Never attempt to touch valve E. We will control vacuum line with the LN2 valve instead. Use 20 mV not 50 mV.

Please provide your contact info

- E-mail:
- Name:
- Lab Day and partner: