

Why Detect Mercury?

Environment:

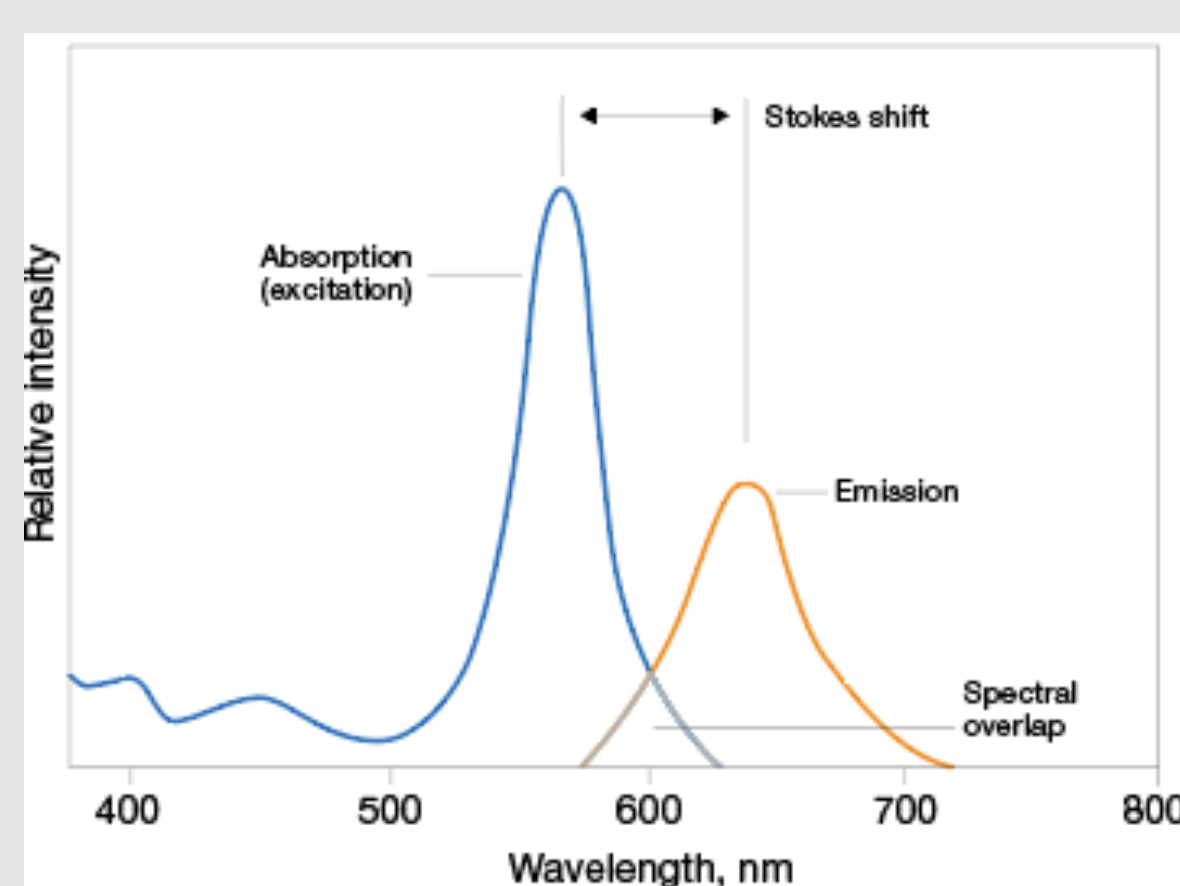
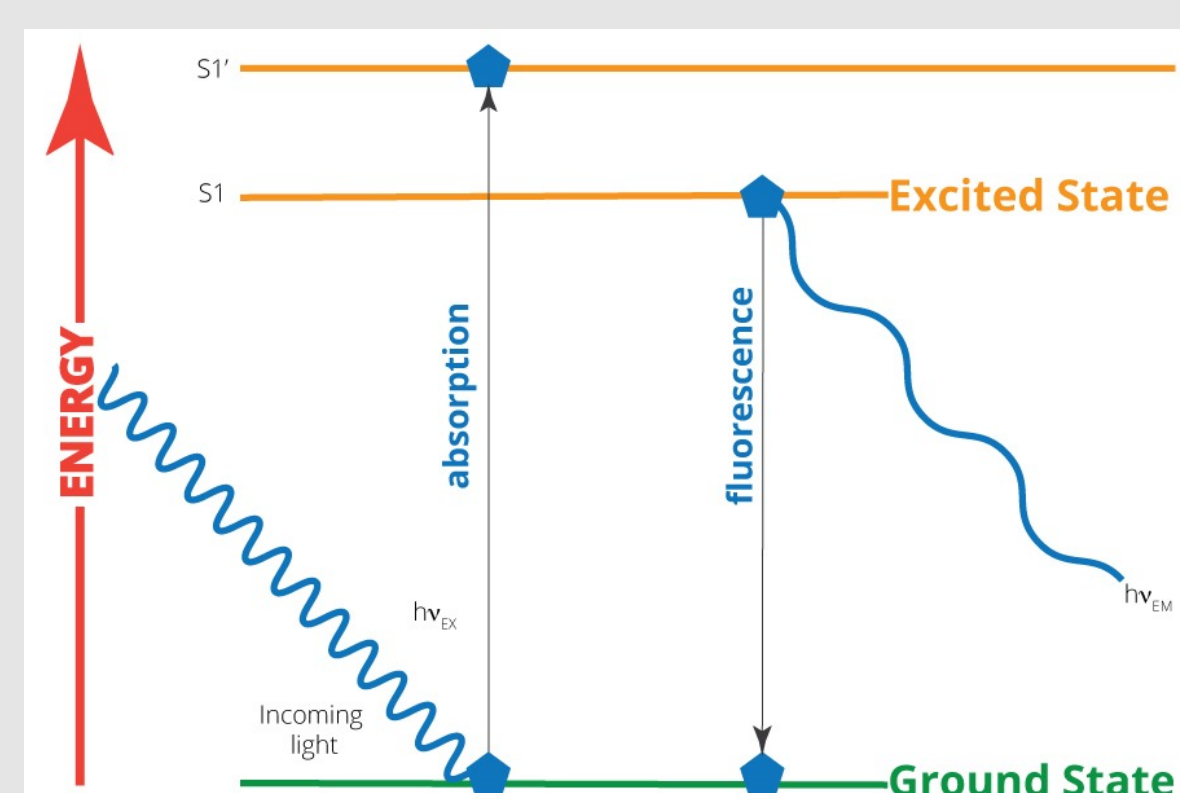
- Mercury is a type of toxic metal that comes in various forms in the environment.
- Amount of mercury in the environment has skyrocketed since industrialization
- Estimated ~70,000 tons of mercury in the oceans alone!

Effects:

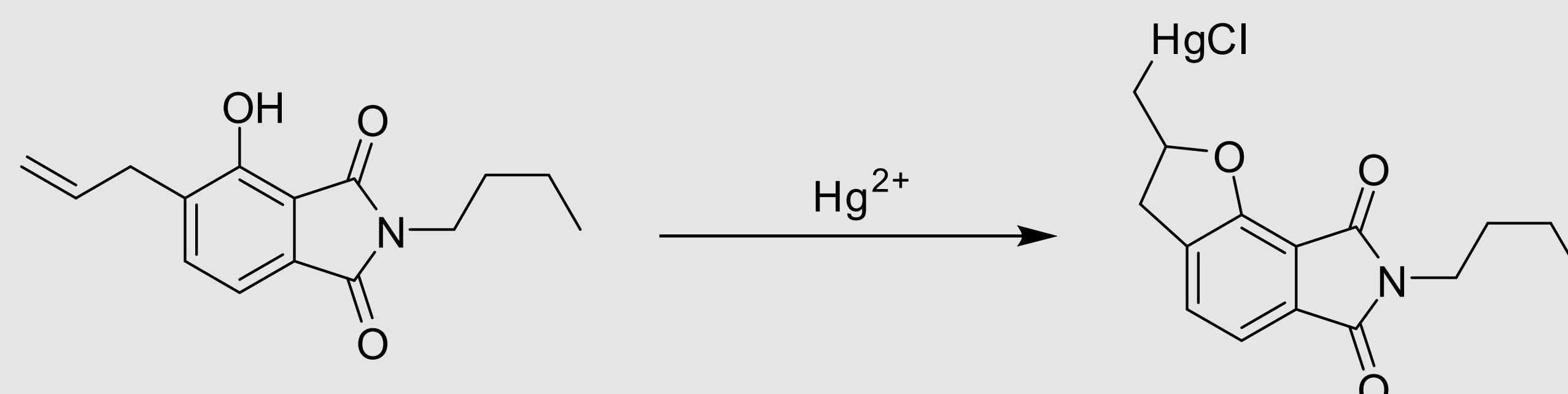
- High doses cause Minamata Disease
- Exposure can harm the brain, heart, kidneys, lungs, and immune system
- Causes nervous system development issues *in utero*
- Loss of neurons with reactive proliferation of glial cells
- Leads to vascular congestion, petechial hemorrhage, and edema

How Does Fluorescence Work?

- Fluorescence occurs when a compound is irradiated with some frequency of energy (λ). Once excited, the relaxation of the molecule emits another wavelength. This emission is the molecule's fluorescence



General Oxymercuration Reaction



MS7, A reported Hg^{2+} fluorescent probe designed by Yang, B. et Al.

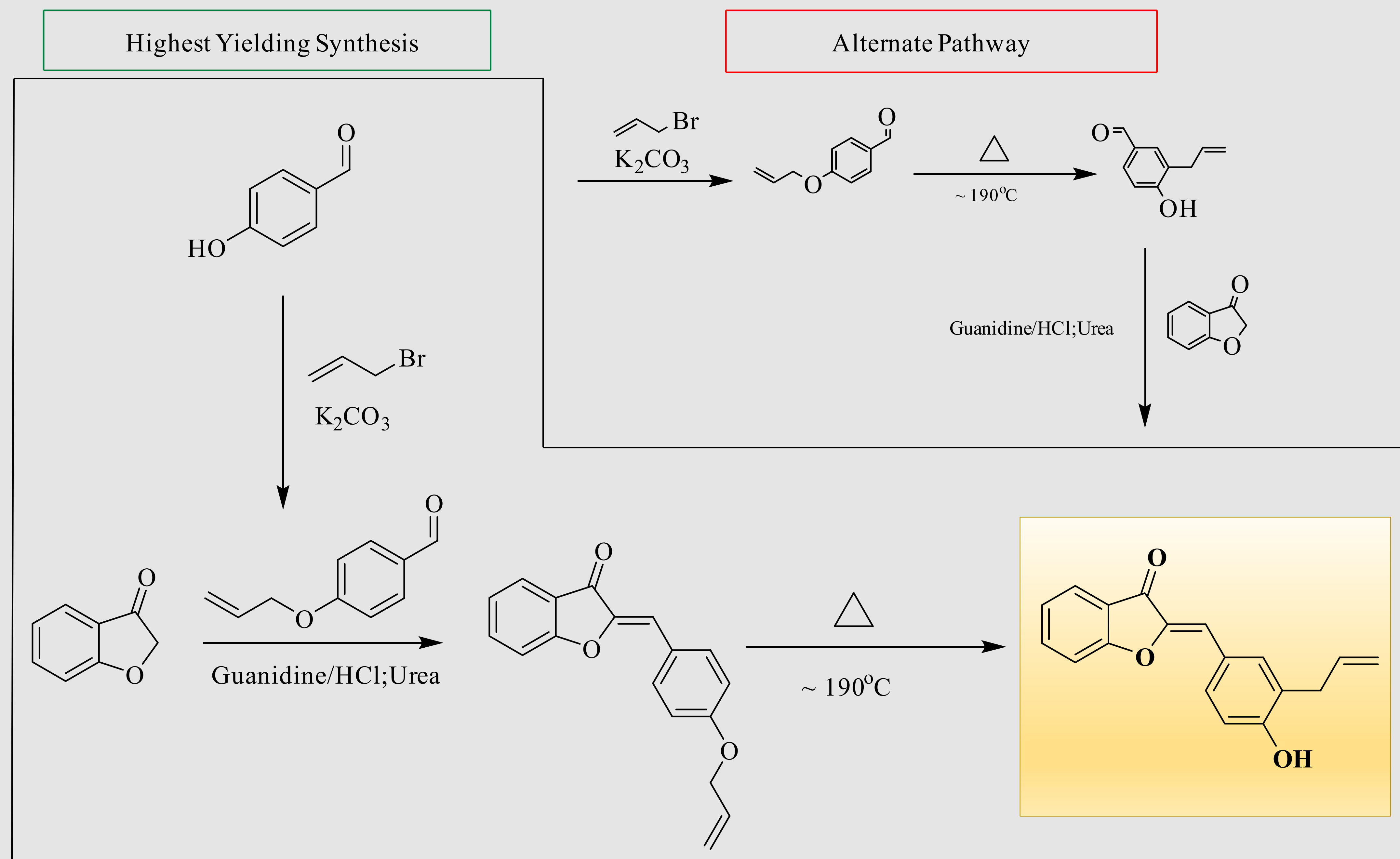
Reaction Properties:

- Intramolecular
- Speedy reaction time
- Terminal alkene selectivity
- Fluorescent "OFF-Switch"

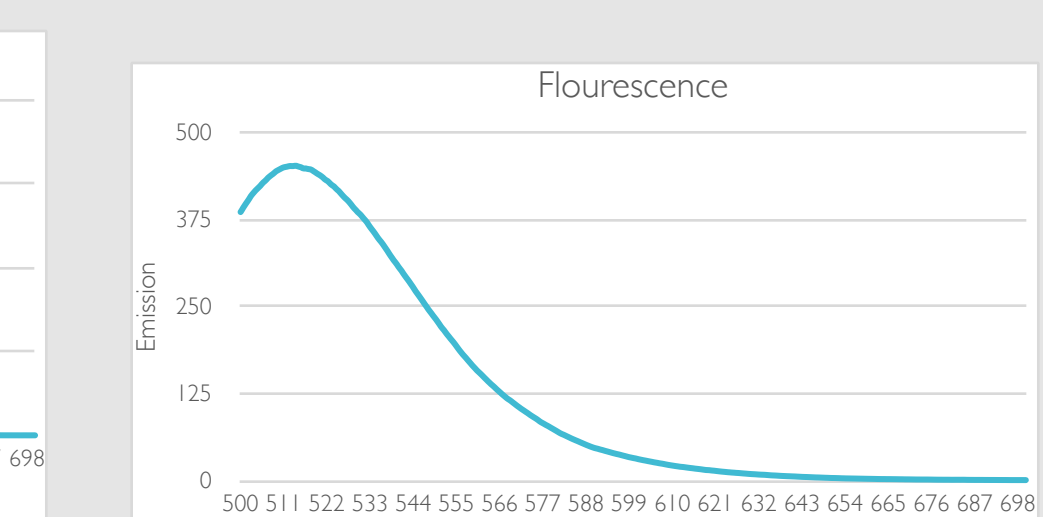
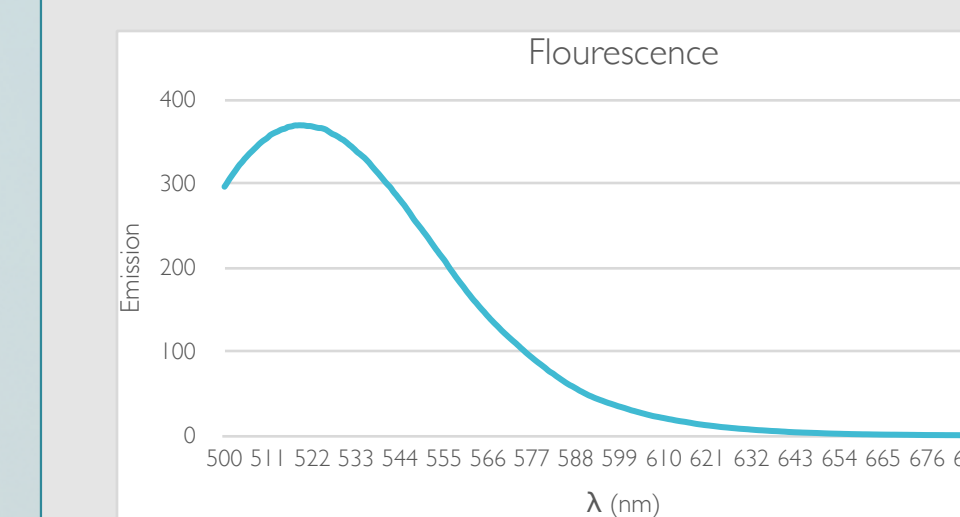
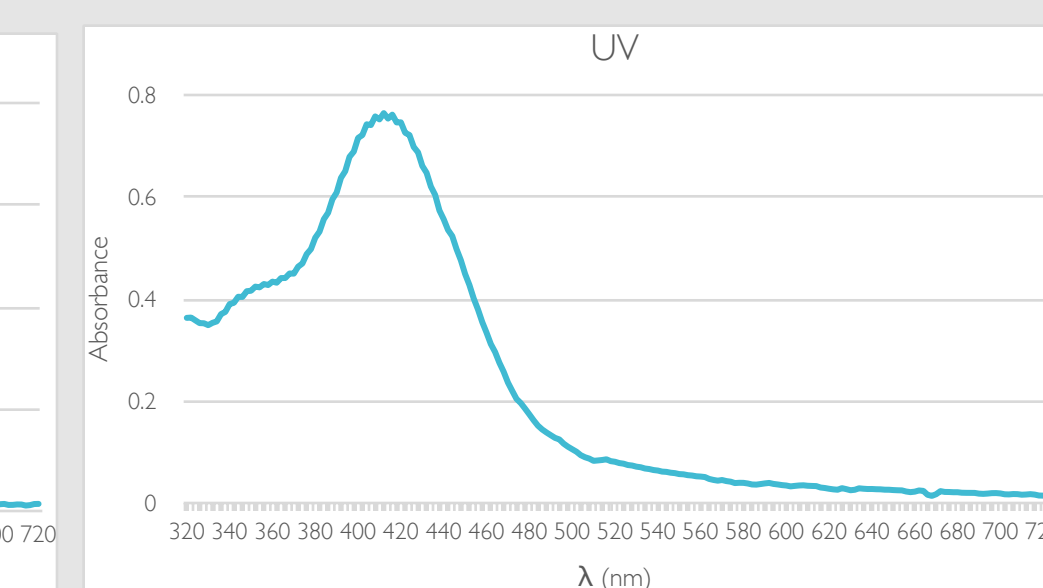
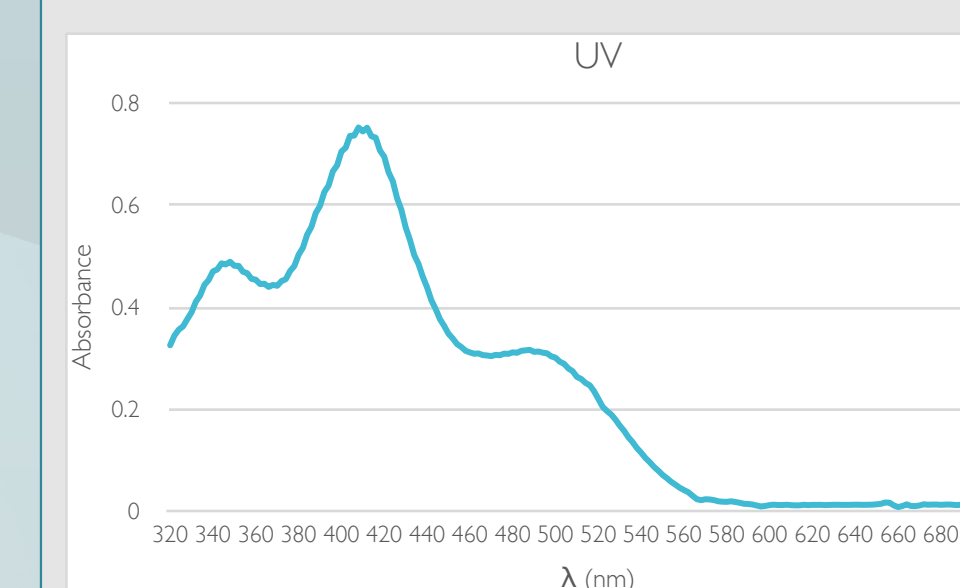
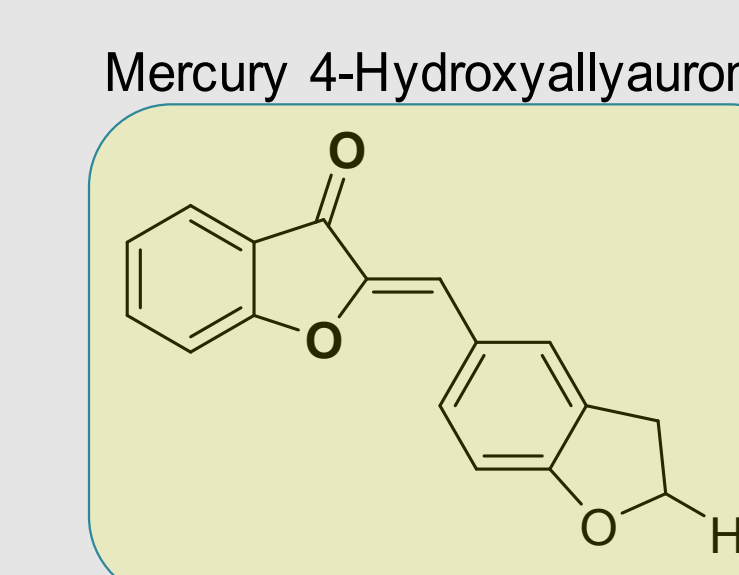
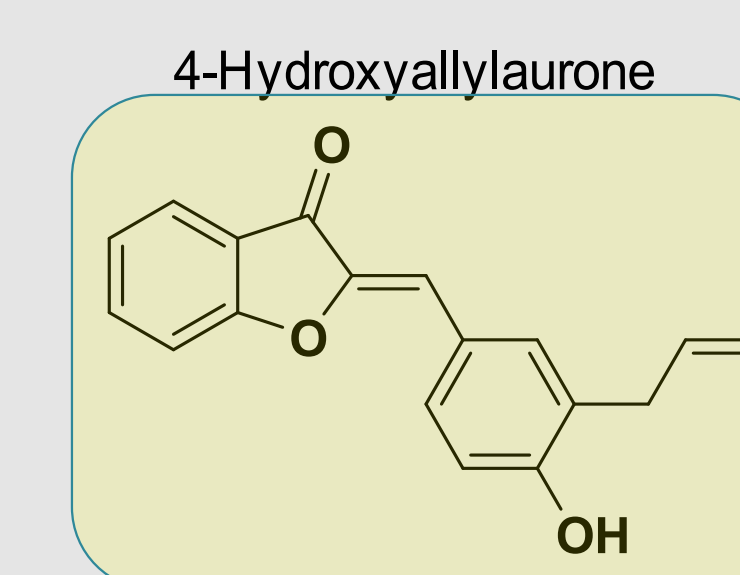
Possible Issues:

- Interaction with other cations (e.g. Ca^{2+} , Zn^{2+} , Ag^{2+})
- Insignificant drop in fluorescence intensity

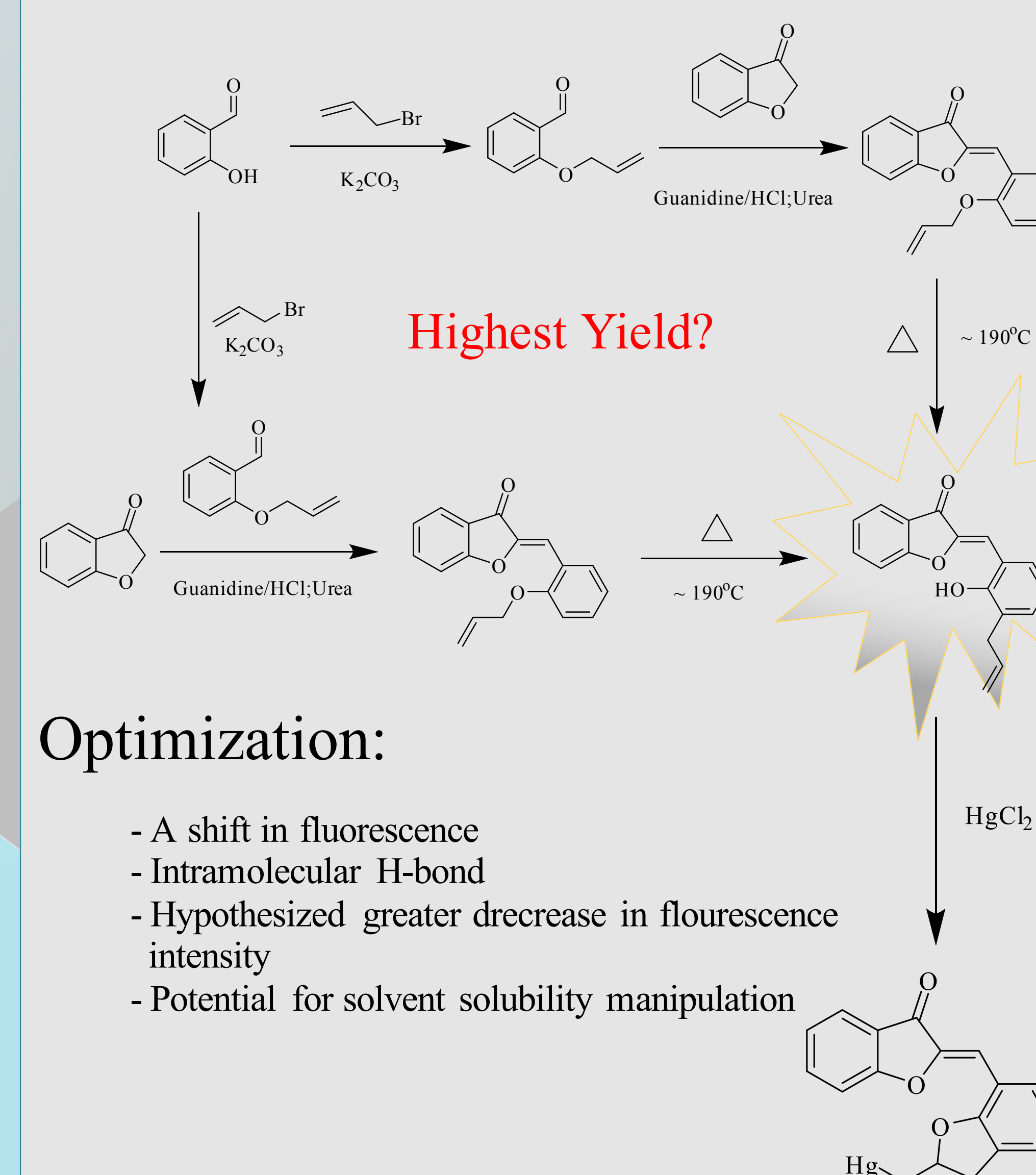
Mercury Sensor Synthesis



Conclusion



Future



Optimization:

- A shift in fluorescence
- Intramolecular H-bond
- Hypothesized greater decrease in fluorescence intensity
- Potential for solvent solubility manipulation

References

- Eto, Komyo, et al. "Differential Diagnosis between Organic and Inorganic Mercury Poisoning in Human Cases-The Pathologic Point of View - Komyo Eto, Yukio Takizawa, Hirokatsu Akagi, Koichi Haraguchi, Shigeyuki Asano, Naohiko Takahata, Hidehiro Tokunaga, 1999." SAGE Journals, 1 Jan. 1993.
- Lai, Qi, et al. "Rational Design and Synthesis of Yellow-Light Emitting Triazole Fluorophores with AIE and Mechanochromic Properties." Chemical Communications, The Royal Society of Chemistry, 7 Mar. 2019.
- Fulghum, Lisa. "Ca2+ Detection in Muscle Tissue Using Fluorescence Spectroscopy." World Precision Instruments, World Precision Instruments, 3 May 2018.

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