

# Studying Fluorescence of Coumarin 102 after NaOH Quenching

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## Introduction / Goals

Coumarin 102 (C102) is a substance which fluoresces in the visible spectrum after being exposed to long-wavelength ultraviolet light. Knowing this, we experimented with various concentrations of C102 with buffer solutions (saline water) and sodium hydroxide (NaOH), a quencher of fluorescence. A quencher causes the visible emission to decrease, releasing heat instead. This chemical reaction is not instantaneous, as it takes time for the NaOH to take full effect.

## Methods

- Initially we mixed various concentrations of C102 with the buffer solutions to observe how they behaved under an ultraviolet light
- We changed the independent variable from concentration of C102 to concentration of NaOH
  - We used a 10MP mobile phone camera to capture images of the solutions immediately after they were formed by Elsadig Abdalla, Anis Barmada, Laina Chatmon, and Sophia O'Connor (Group 1-3), and then again twenty minutes later
  - We analyzed the images using the program ImageJ in order to objectively measure the strength of the visual emission of each sample by uploading the best photo taken
  - Our analysis was limited to the blue channel of an RGB filter of each photo, due to C102 largely fluorescing in the blue spectrum
- We also spaced out the samples so that we could minimize the “bleed,” or interference, of the fluorescence between the cuvettes “contaminating” each others’ measurements

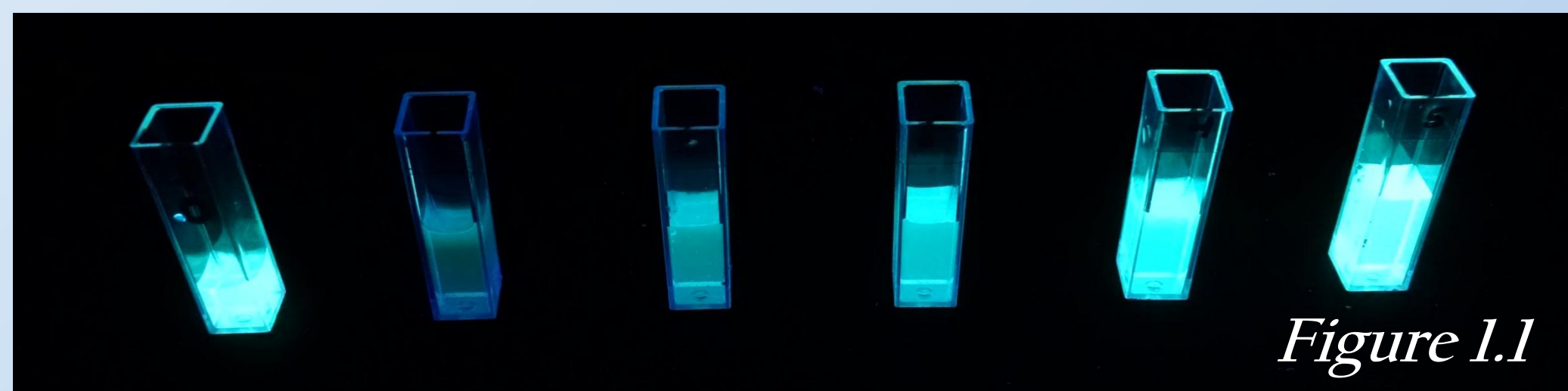


Figure 1.1

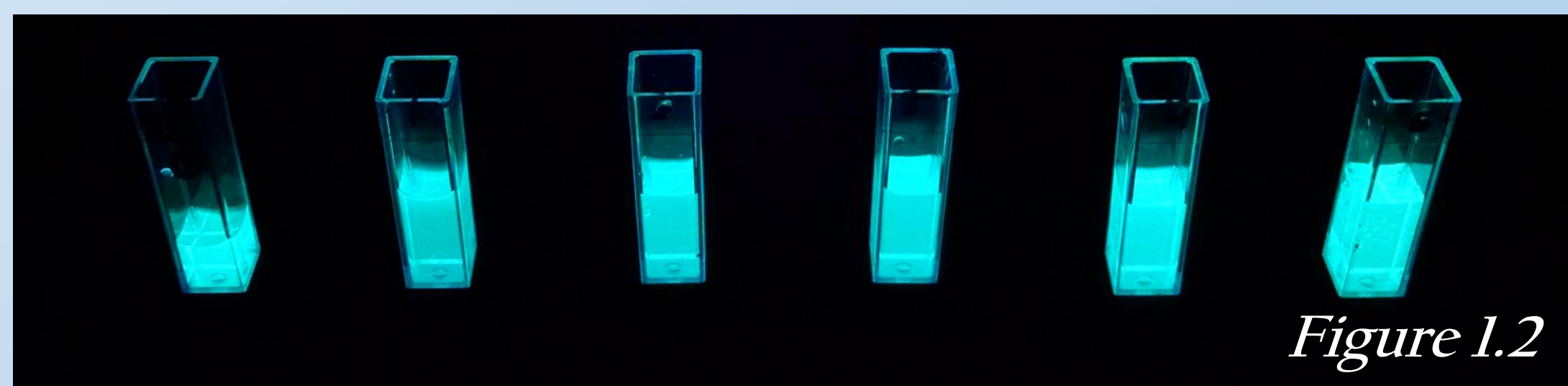


Figure 1.2

## Results

- As the concentration of C102 increased, the fluorescence emitted increased as well (Figures 1.1 and 1.2)
- Conversely, the second set of samples provided by Group 1-3 showed us that as the concentration of NaOH increased, the fluorescence of the samples decreased as their visual emission was quenched (Figure 2.1)
- We also observed that the passage of time resulted in the fluorescence decreasing as well (Figure 2.2)

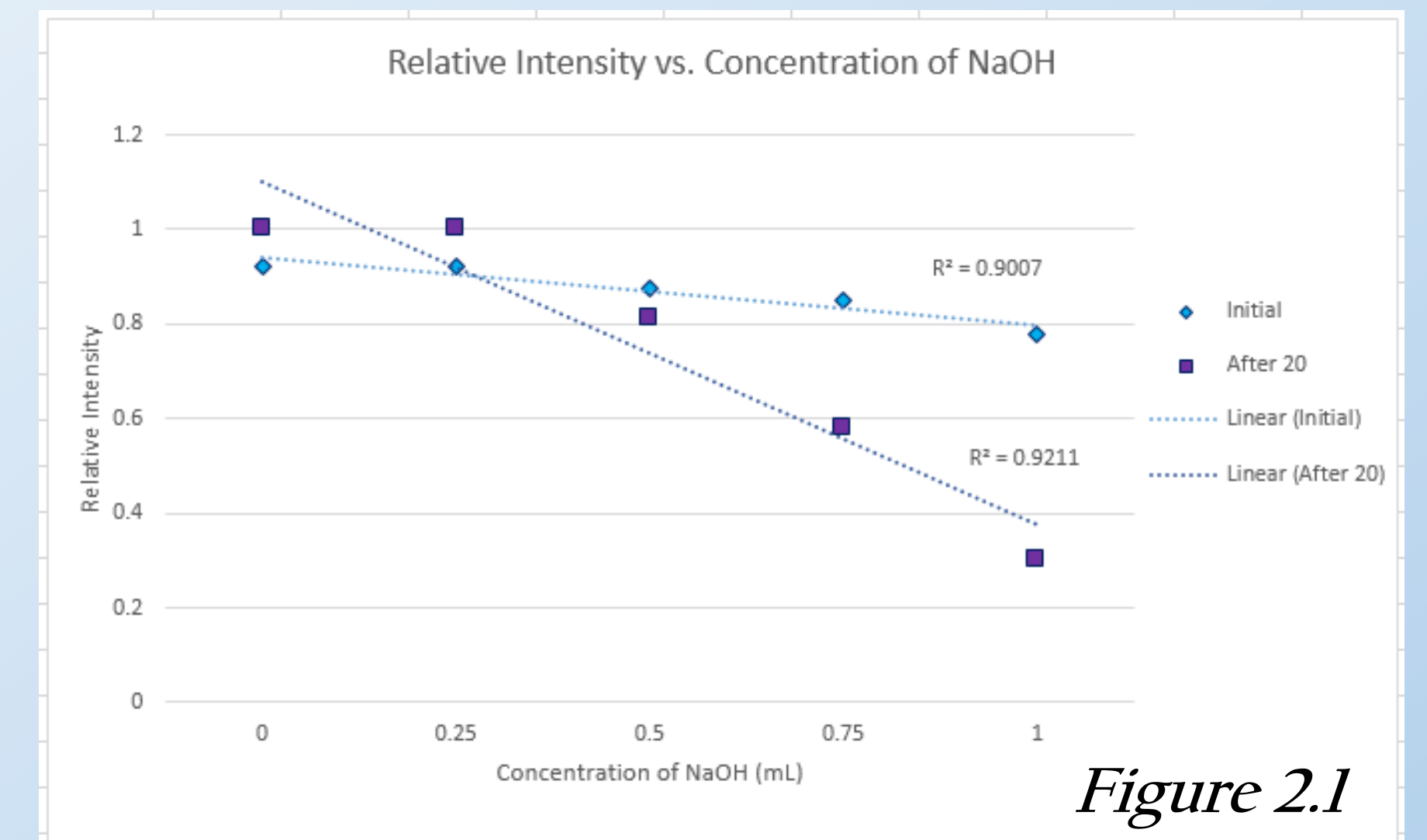


Figure 2.1

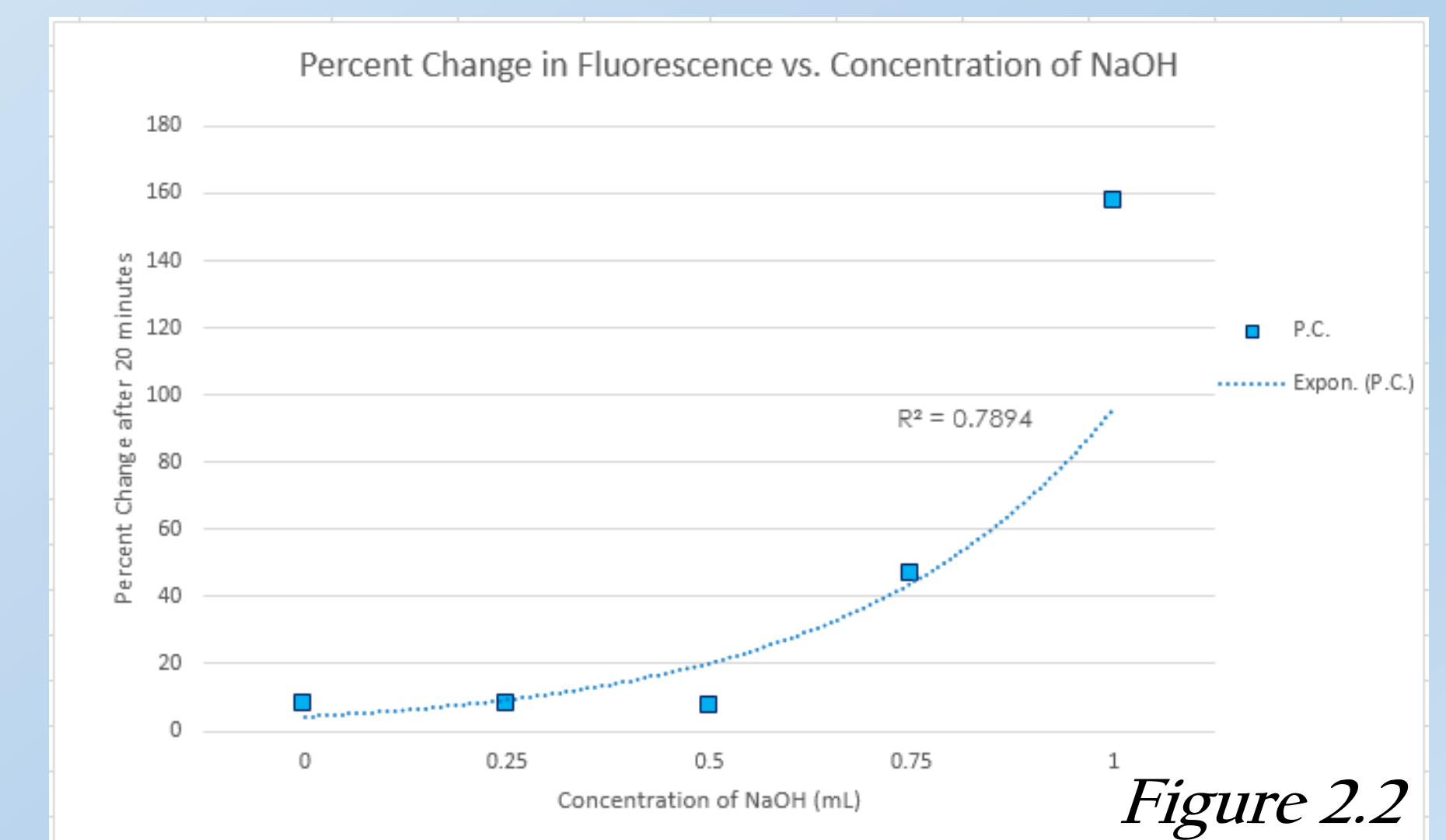


Figure 2.2

## Conclusions

The inverse correlation between time passed and fluorescence emitted occurred as a result of NaOH having more time to react with C102 and quench its fluorescence. We were able to observe that as the concentration of NaOH increased, the percent change in fluorescence over time also increased on an exponential scale. From our results, we can conclude that a greater length of time will quench the fluorescence of the C102 more, and an increased concentration of NaOH increases the rate at which the quenching occurs exponentially. We believe that our experiment could have been improved by using better images of our samples. The most obvious of this change is that we spaced out the cuvettes to minimize the “bleed,” or interference, of the light emitted by some samples being measured in adjacent samples.