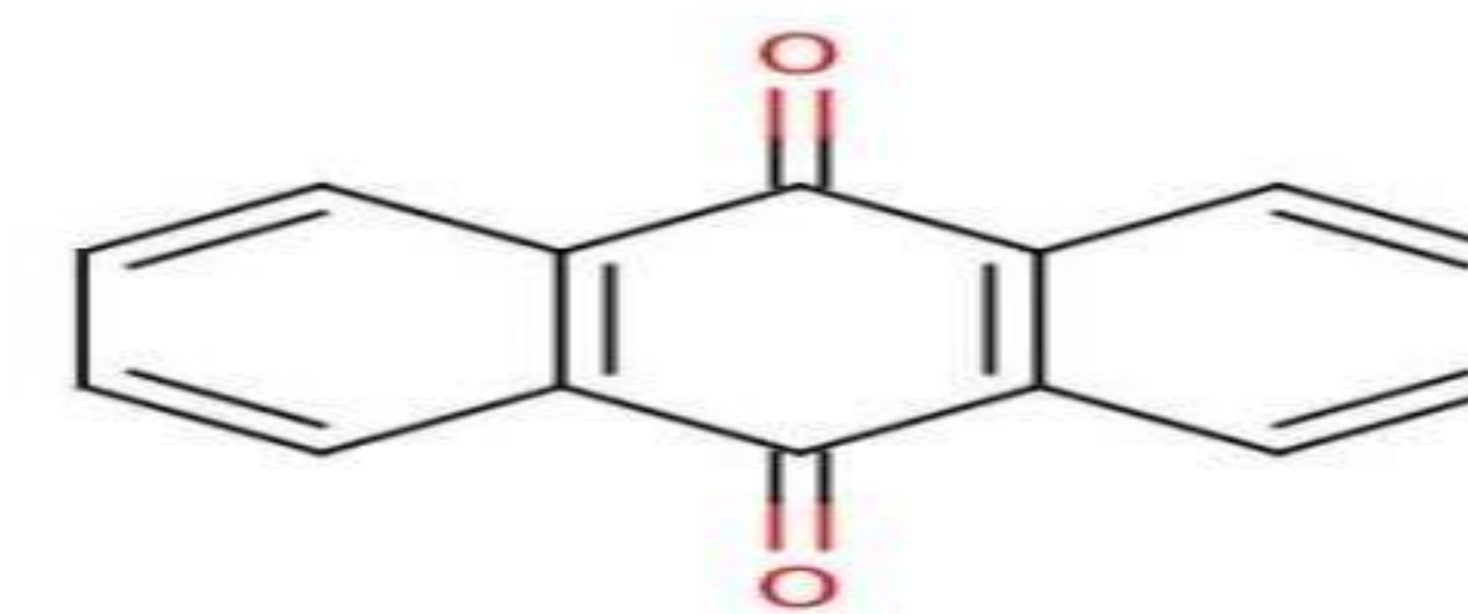


Linear Dichroism of Anthraquinone in stretched Polyvinyl Chloride films

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Introduction

- The goal of my research is to observe and compare the linear dichroism (LD) of a molecule suspended in PVC film.
- Another goal was to compare the amount of stretching vs the LD
- Stretching the films allows for the molecule to elongate and line up so it absorbs polarized light better.
- To measure the LD one must use a polarizer and measure the absorbance with a 0° angle and a 90° angle.
- Take those two measurements and for every data point use the formula $0^\circ - 90^\circ = LD$.

Methods

- Measure out 20% w/v of PVC powder to make the films i.e. for 60 mL measure 3 grams.
- Heat up 60 mL of cyclohexanone to 70°C and slowly start to add the PVC while constantly stirring the mixture while it heats up.
- The mixture should fully dissolve around 100°C and continue stirring for another 5 minutes.
- Add the 0.04 g Anthraquinone to the mixture.
- Continue stirring for another 5 minutes after the Anthraquinone is fully dissolved.
- Clean the plates that will have the mixture poured on it with methanol and heat the plates to 73°C to prevent cracking.
- Once the plates are all poured set for a week to dry with a few mL of cyclohexanone to slow the process.

Linear Dichroism 2.5 SR

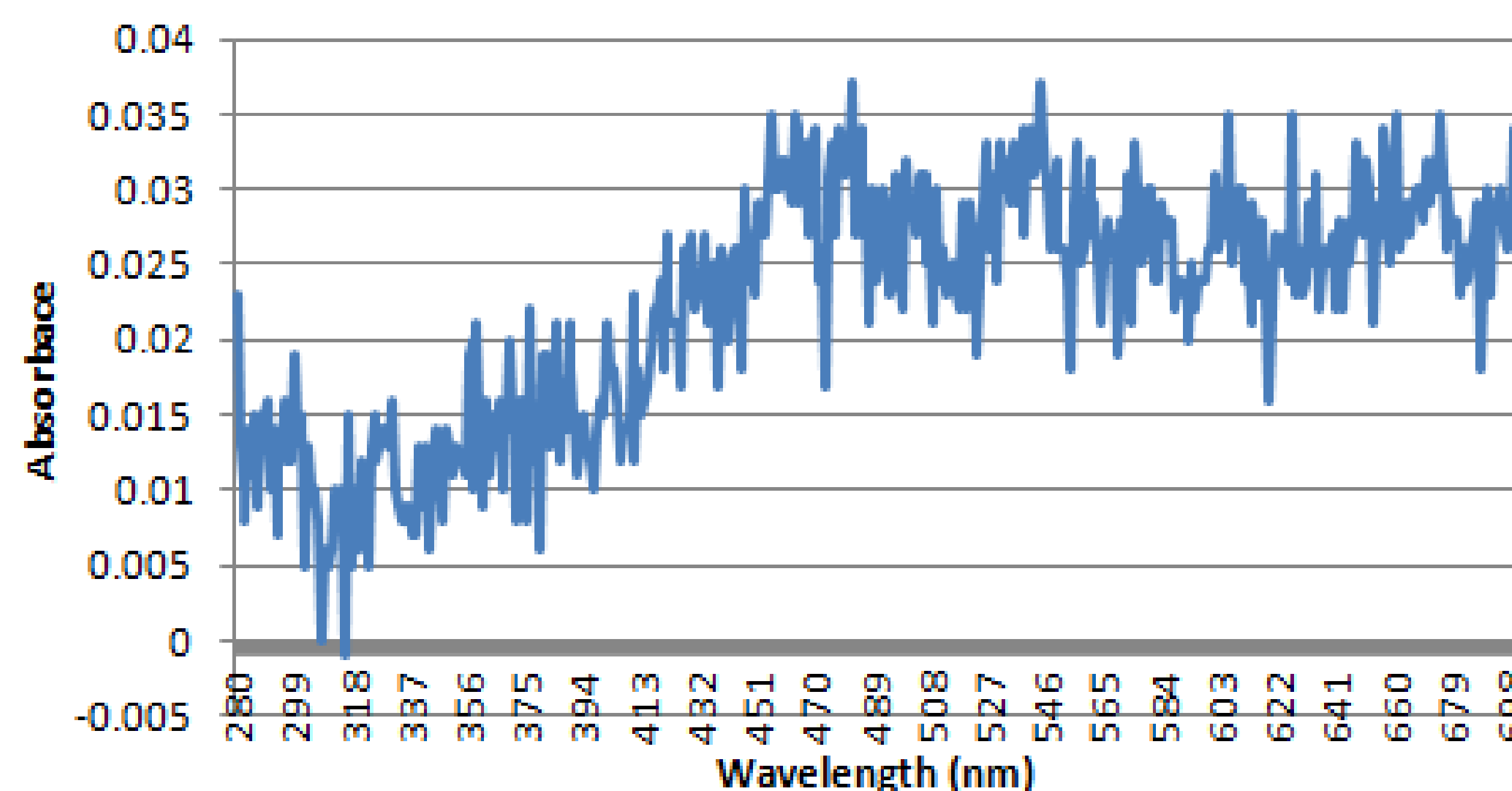


Figure 1: Graph of Absorption (arbitrary units from instrument) versus wavelength (nm) for 0.04 grams of Anthraquinone in 20% w/v PVC with a stretch ratio (SR) of 2.5

Linear Dichroism 0 SR

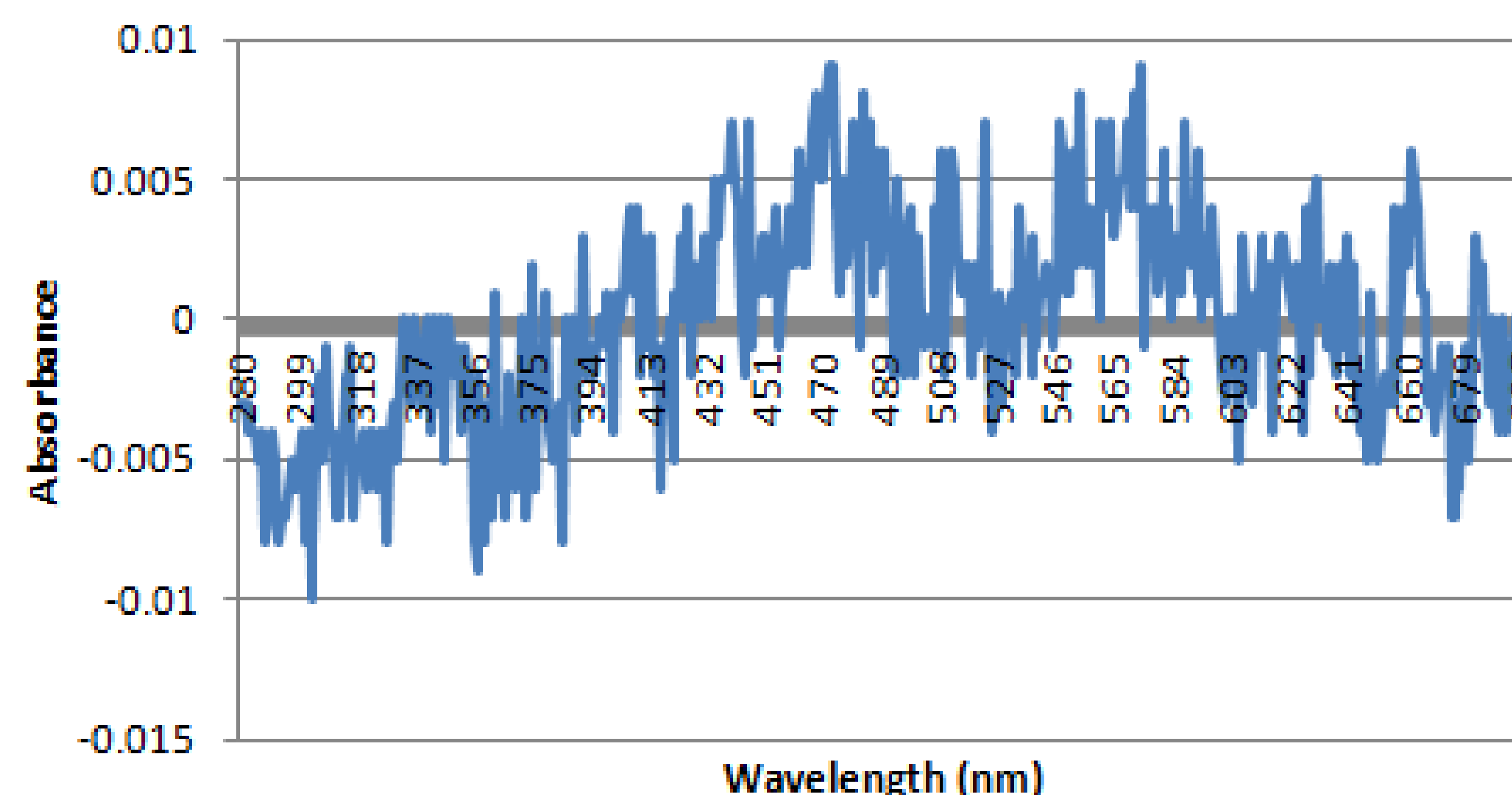


Figure 2: Graph of Absorption (arbitrary units from instrument) versus wavelength (nm) for 0.04 grams of Anthraquinone in 20% w/v PVC with a 0 SR

Results

- The spectrometer data shows that by stretching the PVC films allows for greater absorption by the Anthraquinone.
- For most of the visible spectrum the LD for the Anthraquinone varied from .2 to .3 and falling off outside the visible wavelengths
- The max calculated LD for the stretched film was 0.037 while for the unstretched was 0.009 at around 470 nm.
- However, I did not have enough data to compare multiple stretch ratios and their resulting max calculated LD

Conclusions

- The data shows that by stretching the PVC films it allows for a higher absorbance of polarized light.
- That is due to the molecule lining up along the stretched axis.
- The unstretched film data allows one to visualize exactly how much the absorption increases with the increased stretching.
- There was not enough data to prove that with a higher SR the absorbance would increase as well.
- Based on the data one can calculate that the amount of absorbance with a 2.5 SR is roughly 4 times higher than the unstretched film at their max LD.