

CHEM450 Experiment: EXTRACTION and ANALYSIS of UV ABSORBERS in SUNSCREENS by UV SPECTROSCOPY

Background: Read the attached pages J. Chem. Ed., focusing only on the sections about sunscreens.

Materials:

6 50-mL plastic centrifuge tubes	2 or more quartz cuvettes
6 15-mL plastic centrifuge tubes	1 500-mL beaker
One 1.000-mL autopipet	6 25-mL volumetric flasks
500 mL 2-propanol	
6 sunscreens (3 of the same brand but different SPFs, 2 brands)	

Procedure

A. Sample preparation

1. Preheat water bath in a 500 mL beaker to a temperature of $\sim 45\text{-}50\text{ }^{\circ}\text{C}$.
2. Shake sunscreen bottle for several seconds, then carefully squeeze out 0.250 g into a tared 50-mL centrifuge tube. Add isopropyl alcohol to the 25-mL mark. Shake well.
3. Repeat step 2 for all the other sunscreens.
4. Pour about 10 mL of each of the mixture into separate 15-mL centrifuge tubes. Cap and heat the tubes in water bath for one minute. Cool to room temperature.
5. Centrifuge samples at medium speed for about 2 minutes or until the supernatant is clear.
6. Using a 1.00-mL autopipet, measure out 0.250 mL of the supernatant and dispense onto a labeled 25-mL volumetric flask. Dilute to the mark with isopropyl alcohol. Repeat for all the other samples.

B. Instrumental Analysis

1. Pour enough 2-propanol into a quartz cuvette. This will serve as your blank solution.
2. Starting with the sunscreen with the lowest SPF, pour enough sample from step A6 into another quartz cuvette.
3. Following the operating instructions for the UV spectrometer, record the absorbance spectrum of the sample against the blank. Use the wavelength range 250 to 400 nm.
4. Select the wavelength at which the absorbance is maximum (λ_{max}). Record the absorbance at this wavelength.
5. Repeat spectrum acquisition for the other samples, measuring the absorbance at the λ_{max} . At this point you will see an overlaid spectra of all the samples.

Treatment of data

Answer the following questions. Include the answers in the Discussion section of your lab report.

A. Effect of SPF on Absorbance Spectra

1. Does the absorbance increase linearly with SPF? Why or why not? Discuss possible reasons for your answer.

B. Effect of Brand on Absorbance Spectra

Comparing the absorbance spectra of samples of the same SPF from two different brands of sunscreen:

1. Do the two brands contain the same UV-absorbing species? Explain.

2. Do the two brands have the same amount of UV-absorbing species? Explain.

C. Economic Significance

Include in your discussion the economic significance (i.e. in terms of buying sunscreens) of your results.