

Module 1

Experiment 4: Estimates of SPF Factors in Sunscreens Using UV-Vis Spectroscopy

Lab Assignment

Goals: Using the UV-vis see if the following can be determined:

1. Can a standard curve using SPF 30, 45, 50 and 60 sunscreens be generated?
2. If so, can the SPF factor of another product be determined (student provided known)
3. Can the SPF factor of an unknown (instructor provided) be determined

Suggested Course:

1. Do some web/literature work.
 - What is an SPF?
 - What is UVA and UVB?
 - What are the chemical structures of typical active ingredients within sunscreens and other products that provide a SPF factor?
 - Can the UV spectrum of the other inactive ingredients be assumed negligible?
2. **Determine your dilution scheme:** Use <50 mg of each known sunscreen diluted in a volumetric with methanol. Continue dilutions until the absorbance is below 2.0. **Be efficient with dilutions! There is no need to use more than ~250 mL of methanol per student!!!**
3. Using the Beer-Lambert relationship, determine if a standard plot can be generated based from the data. You may need to generate two plots, one based on UVA and one based on a UVB point.
4. Attempt to generate a plot based on a thin film of the product in the cuvette? Is this possible? What is different about the data?
5. Attempt to determine the SPF factor of your known consumer product using the protocol you have generated. How accurate was your determination based on the claimed SPF factor? Explain.
6. Obtain an unknown product from your instructor and attempt to determine the SPF factor? Report any potential problems with your analysis.

Data: You need the following data: a) dilution scheme for your standard curve using mass of product used vs. volume of methanol. b) Determine final concentration by ppm. c) Standard curve d) calculation of SPF factor for your known e) calculation of the SPF factor of instructor provided unknown

Report Topics

- You should have a full introduction of 2-3 paragraphs discussing the **technical aspects** of an SPF containing product.
- What is the quality of the standard curve? What is R^2 ? Is the intercept zero? Hypothesize about the sources of error.
- Did you need to use two plots for UVA and UVB? Explain. What wavelength(s) did you choose? Why?
- What assumptions are made about an SPF containing product that allow the experiment to work?
- Did your known have a calculated SPF close to the claimed value. If so, why did it work? If not, why not?
- Did the thin film experiment provide any data that surprised you. What are the physical differences between a thin film and a sample in solution that may cause differences in the UV spectrum?