CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
S0516

Project Title
Thin-Layer Chromatography vs. Spectroscopy: Analysis Techniques of Color Identification in Cosmetics

Abstract

Objectives/Goals
The objective of the experiment was to find out which one, Thin-Layer Chromatography (TLC) or Spectroscopy, is a more efficient way to identify and analyze FDA colors present in cosmetics, specifically for those used in the eye area.

Methods/Materials
After 30 standard colors were prepared, I ran them through TLC and spectroscopy, analyzing and comparing the Rf values for TLC and absorption peaks for spectroscopy. Then, I used these techniques to test several samples of actual cosmetic products and obtained data. I also tested three different application techniques to attain more efficient chromatograms.

Results
When testing standard organic colors, both methods were efficient, with spectroscopy being slightly better than TLC. TLC was deficient in separating inorganic colors, while spectroscopy was able to obtain peaks for 10 out of 16 colors tested.
When testing actual samples, however, spectroscopy was largely inept, while Thin-Layer Chromatography showed to be quite efficient as most of the samples separated into several spots. Application technique two (application after development in methylene chloride, vortex, and sonicate) was the most efficient application technique.

Conclusions/Discussion
While spectroscopy was more efficient than TLC when identifying the standard FDA colors, it did not show absorbance peaks for most of samples because of their high concentration and oil-solubility. On the other hand, TLC allows the colors in the samples to be separated. Both spectroscopy and TLC were inefficient in identifying inorganic colors because of their insolubility in water. TLC also allows for analysis of colors based on their qualitative and quantitative data - the color of the spots resulting from separation and the Rf values.

Summary Statement
My project was conducted to compare and contrast two techniques that are used by chemists in color identification in products such as cosmetics.

Help Received
Used lab equipment at a local laboratory