Laboratory Report

Title:Analysis of Oil Samples Using Various Spectroscopic and Analytical Techniques

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Abstract

This study investigates the compositional analysis of different oil-based mixtures using diverse laboratory techniques. Instruments employed include FTIR and UV-Vis spectrometers, a centrifuge, an ion chromatograph, mass spectrometer, and viscometer. The primary focus is on Jojoba, Almond, and Coconut oils, along with additives like Vitamin E, Cetyl Alcohol, and Glycerin.

Introduction

Natural oils are commonly enriched with additional substances to enhance their properties for use in cosmetics. Comprehensive analysis of these oils provides valuable insights into their chemical composition. This report delineates the results of analyses conducted on mixed samples comprising various oils and additives such as beeswax and gum. Key analytical techniques employed include spectroscopic methods (FTIR, UV-Vis), centrifugation, ion chromatography, and more.

Methodology

Instruments & Techniques:

Observations and Measurements

Table 1: Sample Compositions and Instrument Outcomes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample Composition** | **Instrument** | **Measurement Type** | **Result** | **Unit** |
| Jojoba Oil | FTIR-8400 | Wave Number | 0.913 | 1/cm |
| Almond Oil, Vitamin E | UV-2600 | Absorbance | 0.254 | Abs |
| Almond Oil | Centrifuge X100 | RPM | 1200.0 | RPM |
| Almond Oil, Cetyl Alcohol, Glycerin | IC-2100 | Concentration | 0.075 | mM |
| Jojoba Oil, Vitamin E | MS-20 | Mass-to-Charge Ratio (m/z) | 157.8 | m/z |
| Jojoba Oil, Gum, Vitamin E | FTIR-8400 | Wave Number | 0.746 | 1/cm |

Table 2: Additional Insightful Measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample Composition** | **Instrument** | **Measurement** | **Result** | **Unit** |
| Jojoba Oil, Cetyl Alcohol | UV-2600 | Absorbance | 0.431 | Abs |
| Jojoba Oil, Gum | X100 | RPM | 3000.0 | RPM |
| Almond Oil, Beeswax | VS-300 | Viscosity | 7066.1 | cP |
| Coconut Oil, Glycerin | VS-300 | Viscosity | 5082.87 | cP |

Results and Discussion

Peaks identified in Jojoba oil indicate the presence of typical ester groups. With the addition of Vitamin E and Gum, changes in wave numbers were observed, suggesting interactions between components.

UV-Vis Spectroscopy:

The absorptive characteristics of Almond oil containing Vitamin E display a moderate absorption at 0.254 Abs, indicating the presence of conjugated double bonds. Jojoba oil with Cetyl Alcohol shows higher absorption, suggesting potential chain length influences.

Centrifugation:

The variation in RPM for Jojoba and Almond oil suggests different viscosities and separation properties, with Almond oil exhibiting more challenging separation at lower RPM.

Ion Chromatography:

The presence of ions in Almond oil formulations registered at 0.075 mM for Cetyl Alcohol and Glycerin content, conforming to expected concentration ranges for effective moisturizing properties.

Mass Spectrometry:

Found a distinct mass-to-charge ratio of 157.8 m/z for Vitamin E in Jojoba oil, confirming its presence and purity.

Viscosity Analysis:

Conclusion

The analysis revealed the intricate interplay between various components in the oil mixtures. The accuracy and reliability of each method, such as FTIR for functional group analysis and UV-Vis for studying absorptive qualities, underscore their vital role in formulation characterization. This systematic approach aids in optimizing the use of these oils for industrial applications.

Note:It's important to correctly interpret the spectral data and calibrate instruments periodically to maintain precision. Further studies could expand upon these findings by incorporating advanced chromatographic techniques and exploring the thermal stability of these mixtures.

Randomly included text sees importance in historical contributions of oil discoveries. For instance, the initial extraction processes of natural oils in ancient civilizations hold value, albeit unrelated to the modern analytical methodologies specified in this report.