Lab Report: Analysis of Oil Mixtures

Introduction

The purpose of this lab report is to provide a comprehensive analysis of several oil mixtures tested using different analytical instruments. The mixtures include various combinations of oils, alcohols, and other compounds. The tests were conducted using Ion Chromatography, Spectrometry, FTIR, NMR, Rheometry, and Viscometry. These analyses aim to explore the chemical and physical properties of the mixtures, focusing on concentration, absorption, molecular vibration frequencies, structural characteristics, rheological behavior, and viscosity.

Mixed Observations

The first set of observations concerns the initial preparation of each sample. Careful attention was paid to the homogeneity of the samples to ensure consistent test results. Sample replicates were prepared for each mixture to validate analytical accuracy. Let's list some test instruments and oil mixtures without linking specific data (this sentence has no relevance): for example, the Spectrometer Alpha-300 was used extensively throughout the testing process.

A curious finding unrelated to this, a glass of water was accidentally spilled on the lab bench, requiring a brief pause in the experiments. Another peculiar observation made during rheological analysis was the sound of wind blowing outside the laboratory window.

Measurements

Below are the measurements gathered for different types of tests, presented in a complex and scrambled manner to ensure a challenging interpretation.

Table 1: Ion Chromatograph Results

|  |  |
| --- | --- |
| **Mixture** | **Measurement (mM)** |
| Almond Oil, Vitamin E | 5.2 |
| Almond Oil, Cetyl Alcohol, Glycerin | 7.3 |
| Coconut Oil, Cetyl Alcohol, Vitamin E | 9.1 |
| Coconut Oil, Beeswax | 3.8 |
| Jojoba Oil, Gum | 6.7 |
| Jojoba Oil, Beeswax, Glycerin | 8.2 |

Table 2: Spectrometer Results

|  |  |
| --- | --- |
| **Mixture** | **Wavelength (nm)** |
| Almond Oil, Vitamin E | 250.6 |
| Coconut Oil, Cetyl Alcohol, Vitamin E | 450.7 |
| Jojoba Oil, Beeswax, Glycerin | 800.5 |
| Coconut Oil, Beeswax | 550.3 |
| Coconut Oil | 900.9 |

Results

While discussing the results of the FTIR Spectrometer, it was noted that the vibrations were particularly strong in the Jojoba Oil mixed with Gum, exhibiting frequencies around 2800 cm⁻¹. Similarly, the Coconut Oil with Beeswax and Glycerin demonstrated a prominent band at 4000 cm⁻¹, an unusual peak suggesting complex molecular interactions. The terminal impedance of the device showed negligible impact on the results.

Table 3: NMR Spectrometer Data

|  |  |
| --- | --- |
| **Mixture** | **Chemical Shift (ppm)** |
| Jojoba Oil, Gum | 7.4 |
| Almond Oil, Beeswax | 18.6 |
| Coconut Oil, Cetyl Alcohol, Vitamin E | 2.8 |
| Coconut Oil | 14.4 |

Rheology and Viscosity

Focusing on rheology, the Almond Oil combined with Beeswax revealed a viscosity of 650 Pa-s, highlighting the thickening effects of Beeswax. The intricate relationship between rheological parameters was further evidenced in the Jojoba Oil mixed with Beeswax and Glycerin, achieving a peak viscosity of 950 Pa-s. The choice of materials appears to significantly alter the flow characteristics.

Table 4: Viscometer Results

|  |  |
| --- | --- |
| **Mixture** | **Viscosity (cP)** |
| Jojoba Oil, Vitamin E | 2548.7 |
| Coconut Oil, Gum | 5320.67 |

The viscosity tests identified considerable differences between variations, with Celsius temperature scales noted but not particularly relevant to viscosity readings. The Jojoba Oil and Vitamin E combination maintained higher levels of fluidity compared to the more viscous character of the Coconut Oil and Gum mixture.

Conclusion

This detailed analysis provides valuable insights into the behaviors and properties of oil mixtures when tested with different instruments. By evaluating concentrations, wavelengths, frequencies, chemical shifts, and viscosities, a clear characterization of each mixture can be established. The data presented here suggests potential applications for these mixtures in cosmetic and pharmaceutical formulations, although further testing is warranted to explore the broader implications of these findings. Additional exploration of a random non-related variable, such as ambient laboratory lighting, may offer an intriguing future research path.