Laboratory Report: Report\_483

Introduction

This report comprises the analysis of various oil-based mixtures using a diverse array of analytical instruments. The purpose is to evaluate the chemical and physical properties of these mixtures, including Jojoba Oil, Almond Oil, and Coconut Oil combined with different additives such as Gum, Glycerin, Beeswax, and Vitamin E.

Experimentation and Methodology

The analysis was conducted using advanced instrumentation, each providing unique insights into the mixtures:

Observation:The mass spectrum reveals a significant peak at m/z 1500, indicating the presence of a complex ion possibly due to the interaction of Jojoba Oil with other components.

Fourier Transform Infrared (FTIR) Spectrometer (FTIR-8400)

Observation:Strong absorption bands at 1200 1/cm suggest characteristic functional groups, possibly esters or ethers, a notable complex interaction within the mixture.

UV-Visible Spectrophotometer (UV-2600)

Observation:A maximum absorbance of 2.8 indicates significant chromophoric interactions, likely due to Vitamin E’s known chromophore.

Microplate Reader (MRX)

Observation:Optical density measurements suggest standard scattering, consistent with a medium that has minimal absorption features.

Nuclear Magnetic Resonance (NMR) Spectrometer (NMR-500)

Results and Discussion

Table 1: Spectroscopic Analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Instrument** | **Sample** | **Compounds** | **Measurement** | **Units** |
| Mass Spectrometer (MS-20) | Jojoba Oil | Gum, Glycerin | 1500.0 | m/z |
| FTIR Spectrometer | Almond Oil | Gum, Vitamin E | 1200.0 | 1/cm |
| UV-Vis Spectrophotometer | Coconut Oil | Beeswax, Vitamin E | 2.8 | Abs |
| NMR Spectrometer | Almond Oil | Glycerin | 10.5 | ppm |

Table 2: Chromatographics and Physical Characteristics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Instrument** | **Sample** | **Compounds** | **Measurement** | **Units** |
| Liquid Chromatograph | Jojoba Oil | Gum, Vitamin E | 250.0 | ug/mL |
| Viscometer (VS-300) | Coconut Oil | Glycerin | 5046.0 | cP |
| Viscometer (VS-300) | Almond Oil | Gum | 7788.07 | cP |
| Mass Spectrometer (MS-20) | Jojoba Oil | Vitamin E | 1750.0 | m/z |

Random Note:Viscometers also occasionally measure temperatures in Kelvin.

Interestingly, the peak detected at m/z 1750 for Jojoba Oil with Vitamin E suggests a shift after altering the mixture, indicating possible modification in molecular interactions.

Additional Observations

During the data collection, it was noted that the viscosity of Almond Oil varied unexpectedly between tests. The recorded values were 7788.07 cP and 7660.67 cP. The variations could be attributed to slight temperature changes in the lab environment or inconsistencies in sample preparation techniques.

Conclusion

The application of multiple modalities in analyzing these oil-based mixtures elucidates the rich complexity inherent within such formulations. By employing Mass Spectrometry, FTIR, UV-Vis, and other analytical instruments, we have gained a deeper understanding of how components interact on a molecular level.

Further investigation across varying environmental conditions and additional replicates could enrich these findings, providing even deeper insights into the subtleties of these fascinating oil mixtures.

End of Report