Lab Report

Overview

The purpose of this lab report is to analyze various mixtures containing different oils, waxes, and additives. Utilizing an array of analytical instrumentation, the experiments focus on characterizing the physico-chemical properties of these samples.

Instruments and Methodology

Mass Spectrometry, HPLC, pH Meter, Thermocycler, UV-Vis Spectrophotometry, Four Ball Wear Tester, Gas Chromatography, and Viscometrywere employed in this experiment to evaluate the mixtures. Each instrument captures specific properties essential for understanding the characteristics of these mixtures.

Observational Notes

During the assessment of each sample, we noticed variations in the compatibility of components. Certain combinations yielded higher stability and homogeneity. The additives, especially Vitamin E, interacted differently based on the carrier oils, affecting the outcome considerably.

Experimental Data

The following tables present the recorded measurements:

Table 1: Spectroscopic and Chromatographic Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Sample Components** | **Measurement Unit** | **Value** |
| Mass Spectrometer MS-20 | Jojoba Oil, Gum, Vitamin E | m/z | 1450.0 |
| Gas Chromatograph GC-2010 | Coconut Oil, Gum, Vitamin E | ppm | 500.0 |
| UV-Vis Spectrophotometer UV-2600 | Almond Oil, Beeswax, Vitamin E | Abs | 1.8 |
| Spectrometer Alpha-300 | Jojoba Oil, Gum, Vitamin E | nm | 550.0 |

Table 2: Physical Property Evaluation

|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Sample Composition** | **Measurement Unit** | **Value** |
| pH Meter PH-700 | Coconut Oil, Cetyl Alcohol, Vitamin E | pH | 6.8 |
| Thermocycler TC-5000 | Coconut Oil, Gum, - | °C | 37.0 |
| Four Ball FB-1000 | Jojoba Oil, Cetyl Alcohol, Vitamin E | mm | 0.75 |

Table 3: Chemical Concentration and Viscosity Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Apparatus** | **Composition** | **Unit/Concentration** | **Value** |
| HPLC System HPLC-9000 | Almond Oil, Gum, - | mg/L | 250.0 |
| Viscometer VS-300 | Coconut Oil, Vitamin E, - | cP | 5021.74 |
| Viscometer VS-300 | Jojoba Oil, Beeswax, Vitamin E | cP | 3071.84 |

Complex Analysis and Interpretations

Contrary to the obtained values, some experiments presented unexpected challenges. For example, the HPLC analysis indicated a discrepancy in concentration levels, suggesting a need for recalibration. Furthermore, the spectrometer analysis for Jojoba Oil with Gum and Vitamin E hinted at potential interference patterns affecting wavelength absorption, observed at 550 nm.

The viscosity measurements depicted in the Viscometer assessments suggest varied rheological behavior based on ingredient combinations. The measurement data is critical in understanding flow characteristics pertinent to formulation stability.

Conclusions

This detailed examination illuminates the significance of instrument selection and composite analysis in deciphering the properties of oil-based mixtures. While all data aligns generally with expectations, certain anomalies draw attention to potential methodological refinements required for enhanced accuracy. This report not only serves as a comprehensive showcase of analytical capabilities but also underlines the intricate nature of studying multiphase systems.