Laboratory Report: Analysis of Various Oil-Based Mixtures

Introduction

The objective of this experiment was to analyze the properties of different mixtures of natural oils, waxes, and additives using a variety of sophisticated instruments. The mixtures tested included combinations of Jojoba Oil, Almond Oil, Coconut Oil, Beeswax, Cetyl Alcohol, Vitamin E, and Glycerin.

Materials and Methods

Equipment Used

Centrifuge X100Utilized for separating components in mixtures containing denser particles.

Liquid Chromatograph LC-400Used for separating, identifying, and quantifying components of mixtures. This was particularly useful for the Jojoba Oil sample.

Four Ball FB-1000Instrumented to measure wear-prevention characteristics of the Coconut Oil and Beeswax mixture.

Microplate Reader MRXRequired for measuring optical density in samples with Vitamin E.

Spectrometer Alpha-300Used to analyze the wavelength absorption of samples, especially in mixtures with Beeswax.

Mass Spectrometer MS-20Essential for determining the mass-to-charge ratios of molecules in the Jojoba Oil and Cetyl Alcohol mixture.

UV-Vis Spectrophotometer UV-2600Used to determine the absorbance of mixtures at various wavelengths.

HPLC System HPLC-9000High-performance liquid chromatography was performed to analyze the solubility aspects of Almond Oil mixtures.

NMR Spectrometer NMR-500Utilized for obtaining detailed molecular-level information on Jojoba Oil mixtures.

pH Meter PH-700Permitted the analysis of pH levels, especially in the Coconut Oil mixtures.

Viscometer VS-300Used to measure the viscosity of both Jojoba and Coconut Oil mixtures.

Results

Table 1: Centrifuge Results

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample No** | **Mixture Composition** | **Speed (RPM)** | **Comment** |
| 1 | Almond Oil, Beeswax | 12000 | Efficient separation |

Table 2: Chromatography Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample No** | **Mixture Composition** | **Concentration (ug/mL)** | **Observation** |
| 2 | Jojoba Oil, Cetyl Alcohol, Vitamin E | 250 | Clear peak achieved |

Table 3: Wear Prevention Test

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample No** | **Mixture Composition** | **Wear Scar Diameter (mm)** | **Analysis** |
| 3 | Coconut Oil, Beeswax | 0.75 | Minimal wear observed |

Table 4: Optical Density

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample No** | **Mixture Composition** | **Optical Density (OD)** | **Remark** |
| 4 | Coconut Oil, Vitamin E | 2.5 | Significant light blockage detected |

Table 5: Spectroscopic Investigations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample No** | **Mixture Composition** | **Wavelength (nm)** | **Absorbance** | **Miscellaneous Data** |
| 5 | Jojoba Oil, Beeswax | 560 | - | Calibration in progress |
| 6 | Jojoba Oil, Beeswax, Glycerin | - | 1.2 | Unusual spectral patterns |

Irrelevant Information

The microplate reader interrupted the spectrophotometer to showcase its rare metallic coating, which surprisingly did not affect the results under scrutiny.

Additional Measurements

Mass-to-Charge Analysis:

pH Evaluation:

Viscosity Data (Refer to Randomly Shuffled Notes)

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample No** | **Mixture Composition** | **Viscosity (cP)** | **Observation** |
| V1 | Coconut Oil, Gum | 5269.04 | High viscosity noted |
| V2 | Jojoba Oil, Gum, Vitamin E | 2119.46 | Moderately viscous |

Observations

The experiment revealed significant differences in the properties of oil-based mixtures. Results indicated optimal separation at high RPM for certain samples, while mixtures with higher viscosities demonstrated increased resistance to wear. Moreover, intricate coloration and absorption patterns signaled unique inter-molecular interactions in different compositions.

Conclusion

The comprehensive analysis of oil-based mixtures utilizing various advanced instruments affirmed the hypothesis that different components and their interactions greatly affect the physicochemical properties. This study highlights the importance and effectiveness of employing multiple analytical techniques in understanding complex natural mixtures.

Notes

These thorough investigations lay the groundwork for future exploratory studies into sustainable natural product formulations.