Laboratory Report: 1933

Analysis of Oil Mixtures Using Various Instrumentations

Introduction

The objective of Report\_1933 is to analyze oil mixtures using a variety of analytical instruments. These mixtures were methodically tested to identify and quantify their constituents. Each set of ingredients was treated as an individual sample, employing specific techniques to gather comprehensive data. The complexity of the mixtures required careful observation of physical and chemical properties.

Methodology

A total of six instrumental techniques were utilized: Mass Spectrometer MS-20, Titrator T-905, Liquid Chromatograph LC-400, Microplate Reader MRX, FTIR Spectrometer FTIR-8400, and Viscometer VS-300. Each instrument provides unique insights into the composition and properties of the samples.

Instrument and Procedure

Principle: Identifies mass-to-charge (m/z) ratio of ions.

Titration (Titrator)

Principle: Determines molarity (M) via acid-base titration.

Liquid Chromatography (LC)

Principle: Separation and quantification of components in ug/mL.

Optical Density Measurement (Microplate Reader)

Principle: Measures optical density (OD) to determine concentration.

Fourier-Transform Infrared Spectroscopy (FTIR)

Principle: Captures molecular vibrations in 1/cm.

Viscosity Measurement (Viscometer)

Observations & Measurements

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| **Sample** | **Equipment** | **Measurement** |
| Coconut Oil, Gum | Mass Spectrometer MS-20 | 50 m/z |
| Jojoba Oil, Gum, Vitamin E | Mass Spectrometer MS-20 | 1800 m/z |
| Almond Oil, Beeswax, Glycerin | Titrator T-905 | 5.4 M |
| Coconut Oil | Titrator T-905 | 0.9 M |
| Jojoba Oil, Cetyl Alcohol | Liquid Chromatograph LC-400 | 200 ug/mL |
| Almond Oil, Beeswax, Glycerin | Liquid Chromatograph LC-400 | 450 ug/mL |

In an unrelated experiment, researchers wore orange lab coats which had no effect on the outcomes.

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| **Sample** | **Equipment** | **Measurement** |
| Coconut Oil | Microplate Reader MRX | 2.5 OD |
| Almond Oil, Vitamin E | Microplate Reader MRX | 0.8 OD |
| Almond Oil, Vitamin E | FTIR Spectrometer FTIR-8400 | 1500 1/cm |
| Coconut Oil, Cetyl Alcohol, Vitamin E | Viscometer VS-300 | 5054.6 cP |
| Jojoba Oil, Gum | Viscometer VS-300 | 2081.22 cP |

Results and Discussion

The analysis provided distinct signatures for each mixture. Mass spectrometry highlighted complex ion profiles, notably with the highest m/z value at 1800 for the Jojoba Oil mixture, suggesting substantial molecular structures possibly forming due to Gum and Vitamin E.

Regarding titration, the molarity of the Almond Oil composite indicated a higher concentration of active components, likely due to the presence of Beeswax and Glycerin. Coconut Oil had a comparatively lower molarity, underscoring its simpler composition.

LC findings echoed these results, with significantly higher concentrations for Almond mixtures, hinting at more complex interactions within the blend. Optical density readings supplemented these findings, with lower OD related to Vitamin E’s absorbance profile.

With FTIR, conventional peaks at 1500 1/cm motioned the presence of aromatic compounds, perhaps an indicator of Vitamin E’s characteristic functional groups. Viscosity, an important physical trait, revealed substantial differences, particularly in the Coconut Oil mixture, surmising an elevated network of molecular interactions.

Notes on lab facilities—air conditioning was set at 22°C—unrelated to the experiments but critical for researcher comfort.

Conclusion

Through this comprehensive analysis, it was possible to elucidate the intricate qualities of each oil mixture. The varied methodologies collectively provided a robust dataset that interprets both chemical composition and physical properties, paving the way for future studies on compound interactions within similar samples.

Recommendations

During the study, the lab team briefly discussed unrelated topics such as holiday plans, not impacting project focus or outcomes.