Lab Report: Complex Mixture Analysis

Report ID: Report\_1536

Introduction

This lab report presents the results of various analyses performed on different oil-based mixtures using multiple instruments. The purpose of these tests was to analyze the properties and compositions of the test samples, including Almond Oil, Jojoba Oil, and Coconut Oil combined with a variety of other compounds such as Gum, Cetyl Alcohol, and Vitamin E. Each mixture was subjected to specific analytical techniques, yielding data necessary for comprehensive evaluation.

Experimental Methods and Instrumentation

Measurement:Optical Density (OD) = 2.3

NMR Spectroscopy with NMR-500

Sample 2:Coconut Oil, Beeswax, and Glycerin

Gas Chromatography Analysis with GC-2010

Measurement:500 ppm

UV-Vis Spectrophotometry with UV-2600

Measurement:1.5 Abs

FTIR Spectroscopy using FTIR-8400

Measurement:3500 1/cm

Titration with T-905

Measurement:0.005 M

Thermal Analysis with Thermocycler TC-5000

Measurement:45 °C

X-Ray Diffraction using XRD-6000

Measurement:160 °C

Viscosity Measurements using Viscometer VS-300

Results

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Sample** | **Measured Value** | **Unit** |
| Microplate Reader MRX | Almond Oil, Gum | 2.3 | OD |
| NMR Spectrometer NMR-500 | Almond Oil, Cetyl Alcohol, Vitamin E | 18 ppm | ppm |
| nan | Coconut Oil, Beeswax, Glycerin | 12 ppm | ppm |
| Gas Chromatograph GC-2010 | Almond Oil, Cetyl Alcohol | 500 ppm | ppm |
| UV-Vis Spectrophotometer UV-2600 | Jojoba Oil, Glycerin | 1.5 | Abs |
| FTIR Spectrometer FTIR-8400 | Almond Oil, Glycerin | 3500 | 1/cm |
| Titrator T-905 | Coconut Oil, Cetyl Alcohol, Glycerin | 0.005 | M |
| Thermocycler TC-5000 | Coconut Oil | 45 | C |
| X-Ray Diffractometer XRD-6000 | Jojoba Oil, Gum, Vitamin E | 160 | C |
| Viscometer VS-300 | Jojoba Oil, Cetyl Alcohol | 2756.94 | cP |
| nan | Coconut Oil, Beeswax | 5096.72 | cP |

Discussion

The combination of Almond Oil with other substances such as Cetyl Alcohol and Vitamin E revealed interesting chemical behaviors. The 18 ppm shift observed in NMR indicates interactions between Vitamin E and the other constituents. Similarly, the use of different methodologies, including FTIR and UV-Vis, allowed for an in-depth analysis of molecular vibrations and optical properties within the samples.

Gas chromatographic data yielded challenges in peak resolution, attributed to complex mixtures resulting in overlapping. The temperature controls facilitated by the Thermocycler and constant measurements delivered reliable data, crucial for analyzing the thermal stability of the Coconut Oil-based mixtures.

The viscosity measurements further demonstrated the significant variation in physical properties related to different oil and additional component combinations. Notably, the Coconut Oil and Beeswax mixture exhibited the highest viscosity, reinforcing the influence of Beeswax's structure on the resultant mixture.

Conclusion

This experimental series illustrated the intricate characteristics of oil-based mixtures through diverse analytical approaches. Each instrument provided unique insights, contributing comprehensively to understanding each sample's physicochemical properties.

Overall, the interactions, stability, and compositional dynamics observed authenticate the importance of multifaceted analyses. Further studies could explore the potential industrial applications of these observations, focusing on optimizing mixture characteristics for specific uses.

Noteworthy Anomalies

Unexpectedly, irrelevant signals were detected during X-Ray Diffraction, suggesting possible contamination. Additionally, random noise in the NMR readings warrants further investigation to ensure data integrity.