Laboratory Report 2372

Introduction

The purpose of this experiment was to analyze the chemical properties of various natural oil mixtures using different spectroscopic and chromatographic techniques. Each set of ingredients was treated as a distinct sample to determine the concentration of specific components or the characteristics of the mixtures. The instruments used in this study ranged from spectrometers to chromatographs, each providing unique insights into the chemical makeup of the samples.

Materials and Methods

The samples under investigation included combinations of Almond Oil, Jojoba Oil, and Coconut Oil with other ingredients like Beeswax, Cetyl Alcohol, Gum, Glycerin, and Vitamin E. These mixtures were analyzed using several advanced instruments, including:

Instrument Descriptions

Used to measure the absorption of Almond and Coconut Oils at specific wavelengths (e.g., 750 nm, 950 nm).

Gas Chromatograph GC-2010:

Deployed to identify the composition in samples containing Jojoba Oil and Almond Oil, specifically looking at compounds like Gum and Beeswax, calibrated in ppm.

NMR Spectrometer NMR-500:

Essential for detecting concentrations of chemical components in Almond and Jojoba Oils (e.g., Vitamin E, Cetyl Alcohol) in ppm.

Mass Spectrometer MS-20:

Applied to examine the molecular weight of components in Coconut Oil mixtures, captured in m/z units.

Titrator T-905:

Used for determining the molarity of Vitamin E in Jojoba Oil samples with a precision scale (e.g., 5.2 M).

X-Ray Diffractometer XRD-6000:

Analyzed the crystallography of compounds in Almond Oil mixtures at 160 °C.

HPLC System HPLC-9000:

Observations

Table 1: Spectroscopy and Chromatography Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample No.** | **Sample Components** | **Instrument Used** | **Key Measurement** | **Unit** |
| 1 | Almond Oil, Vitamin E | Spectrometer Alpha-300 | 750.0 | nm |
| 2 | Jojoba Oil, Gum, Glycerin | Gas Chromatograph GC-2010 | 350.0 | ppm |
| 3 | Almond Oil, Beeswax | NMR Spectrometer NMR-500 | 15.0 | ppm |
| 4 | Coconut Oil, Cetyl Alcohol | Mass Spectrometer MS-20 | 1200.0 | m/z |
| 5 | Jojoba Oil, Cetyl Alcohol | Titrator T-905 | 5.2 | M |
| 6 | Almond Oil, Vitamin E | X-Ray Diffractometer XRD-6000 | 160.0 | C |
| 7 | Jojoba Oil, Gum, Glycerin | HPLC System HPLC-9000 | 450.0 | mg/L |
| 8 | Coconut Oil, Glycerin | Spectrometer Alpha-300 | 950.0 | nm |
| 9 | Almond Oil, Beeswax | Gas Chromatograph GC-2010 | 200.0 | ppm |
| 10 | Jojoba Oil, Vitamin E | NMR Spectrometer NMR-500 | 8.0 | ppm |

Detailed Results

TheSpectrometer Alpha-300was applied to multiple samples to measure the absorbance spectra at different wavelengths. For instance, Sample 1 with Almond Oil and Vitamin E showed significant absorption at 750 nm, whereas Sample 8 with Coconut Oil reflected a peak at 950 nm, showcasing distinct spectral properties among different oils.

Gas Chromatograph GC-2010helped ascertain the concentration of impurities and additives. Sample 2 showed Gum presence at 350 ppm, and Sample 9 revealed Beeswax at a remarkable 200 ppm in Almond Oil, indicating varying levels of purity and processing in these oils.

Using theNMR Spectrometer NMR-500, precise measurements of low ppm concentrations were achieved. Jojoba Oil's interaction with Cetyl Alcohol and Vitamin E in Sample 10 indicated a concentration of 8 ppm, highlighting the sensitivity of NMR in quantifying components within complex mixtures.

TheMass Spectrometer MS-20provided critical molecular weight data for Sample 4, identifying a major peak at 1200 m/z, corresponding to Cetyl Alcohol's high mass present in Coconut Oil.

Titrator T-905measured the molarity of Vitamin E efficiently in Sample 5, with a value of 5.2 M, underscoring the titrator's capability in handling homogenous liquid mixtures with precision.

Table 2: Miscellaneous Observations (Irrelevant Data Incorporated Randomly)

|  |  |
| --- | --- |
| **Observation** | **Description** |
| Angular rotational speed | Utilized for calibrating non-related sample |
| Ambient room temperature | Maintained roughly at 20°C for stability |
| Noise filtering factor | Reduced to minimize irrelevant spectral noise |

Conclusion

Through the use of various sophisticated analytical instruments, this study has highlighted the diversity in chemical compositions and characteristics specific to different natural oil mixtures. Each instrument provided unique insights, demonstrating its suitability and accuracy for specific analytical needs. Despite some randomly inserted data and unrelated observations, the core findings illustrate valuable differences in oil properties and component concentrations. Hence, further research could expand on these methodologies to better understand the potential applications and benefits of these natural oil mixtures.