Laboratory Report 1134

Introduction

This report documents the analytical testing conducted on various oil mixtures and compounds using several advanced spectrometric and chromatographic methods. The tests aimed to identify specific chemical constituents and to quantify their concentrations within each sample. The following state-of-the-art equipment was utilized during the experiments: FTIR Spectrometer FTIR-8400, NMR Spectrometer NMR-500, UV-Vis Spectrophotometer UV-2600, HPLC System HPLC-9000, and pH Meter PH-700.

Materials and Methods

Equipment and Instruments

Mode: Attenuated Total Reflectance (ATR)

NMR Spectrometer (NMR-500)

Solvent: Deuterated chloroform

UV-Vis Spectrophotometer (UV-2600)

Mode: Absorbance

HPLC System (HPLC-9000)

Mobile Phase: Methanol:Water (70:30)

pH Meter (PH-700)

Samples Analyzed

A variety of oil mixes were tested, each comprising distinct combinations of natural and synthetic additives.

Results and Discussion

FTIR Spectroscopy

The FTIR analysis provided valuable insights into the functional groups present in the oil mixtures. The key absorbance peaks were:

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| **Sample ID** | **Compounds** | **Notable Peak (1/cm)** | **Observations** |
| FTIR\_S1 | Almond Oil, Gum | 1200 | Indicative of C-O stretching. |
| FTIR\_S2 | Coconut Oil, Beeswax | 2500 | Characteristic of C-H alkane stretch. |

The presence of these peaks aligns with known functional group absorption characteristics, allowing for confident identification of the components.

NMR Spectroscopy

NMR spectroscopy was executed to identify hydrogen environments within the samples.

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| **Sample ID** | **Compounds** | **Chemical Shift (ppm)** | **Observations** |
| NMR\_S1 | Coconut Oil | 2.5 | Peak suggests methyl group adjacent to electronegative atom. |
| NMR\_S2 | Almond Oil | 3.8 | Deshielded proton in ester linkage. |

The detection of these shifts confirms the presence of ester and alkane groups within the structural makeup of the samples.

UV-Vis Spectrophotometry

The absorbance profiles were analyzed to assess the presence of conjugated systems within the mixtures.

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| **Sample ID** | **Compounds** | **Absorbance (Abs)** | **Observations** |
| UV\_S1 | Almond Oil, Beeswax | 1.2 | Indicative of moderate conjugation. |
| UV\_S2 | Almond Oil, Glycerin | 0.7 | Potential minor chromophores present. |

Absorbance levels reveal varying degrees of chromophore presence, corresponding to the complexity of molecular constituents.

HPLC Analysis

The separation and quantification of mixtures were achieved through high-performance liquid chromatography.

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| **Sample ID** | **Compounds** | **Concentration (mg/L)** | **Observations** |
| HPLC\_S1 | Jojoba Oil, Beeswax, Glycerin | 10.5 | Consistent baselines observed. |
| HPLC\_S2 | Almond Oil, Cetyl Alcohol, Vitamin E | 15.2 | High Vitamin E retention. |

Quantitative analysis confirmed the concentrations of target compounds, indicating successful separation efficiency of the HPLC protocol.

pH Measurement

The pH of the sample was vital for understanding its stability and potential for emulsification.

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| **Sample ID** | **Compounds** | **pH** | **Observations** |
| pH\_S1 | Coconut Oil, Cetyl Alcohol | 6.8 | Neutral, ideal for skincare formulations. |

The pH measurement indicates a stable emulsion potential for various personal care applications.

Conclusion

The comprehensive analyses via FTIR, NMR, UV-Vis, HPLC, and pH meter provided not only qualitative but quantitative verifications of the components within each oil mixture. These tests afford insight into the viability of the mixtures for potential applications within the cosmetics and food industries, showcasing the instruments' capabilities in reliable, repetitive testing scenarios.

Note: Ensure the cleanliness of equipment post-analysis to avoid cross-sample contamination in future tests.