Lab Report: Analysis of Various Oil-Based Mixtures

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Introduction

This report encapsulates the examination of various oil-based mixtures tested with advanced analytical instruments. Each mixture, composed of different combinatory elements such as oils and stabilizers, was subjected to rigorous analysis to assess its physicochemical properties. The primary constituents explored were Jojoba Oil, Almond Oil, and Coconut Oil, which were further combined with elements like Gum, Vitamin E, Cetyl Alcohol, and others.

The instrumentation employed for these tests includes, but is not limited to, conductivity meters, UV-Vis spectrophotometers, high-performance liquid chromatography (HPLC) systems, titrators, Fourier-transform infrared (FTIR) spectrometers, nuclear magnetic resonance (NMR) spectrometers, and viscometers. Measurements such as conductivity, absorbance, concentration, and viscosity were meticulously recorded.

Materials and Methods

Instruments Used:

Sample Preparation:Each mixture sample was prepared by homogeneously blending the specified oil with other ingredients in predefined proportions. Subsequent analyses were performed as per the respective instrument's operational guidelines.

Observations and Measurements

Conductivity Studies

The conductivity of Jojoba Oil mixtures was thoroughly investigated, revealing intriguing results.

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| **Sample Composition** | **Instrument** | **Conductivity (uS/cm)** |
| Jojoba Oil, Gum, Vitamin E | CM-215 | 1560 |
| Coconut Oil, Cetyl Alcohol, Vitamin E | CM-215 | 1340 |

Observation:Jojoba Oil displayed higher conductivity potentially due to its unique interaction with Gum and Vitamin E.

Optical Absorbance via UV-Vis Spectrophotometry

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| **Sample Composition** | **Absorbance (Abs)** |
| Jojoba Oil, Cetyl Alcohol, Vitamin E | 2.8 |
| Coconut Oil, Gum, Glycerin | 2.3 |

The UV-Vis analysis uncovered that enhanced absorbance was evident in mixtures with Jojoba Oil. Interestingly, the presence of Cetyl Alcohol contributed to this phenomenon.

HPLC Analysis

Concentration Findings:

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| **Sample Composition** | **Concentration (mg/L)** |
| Jojoba Oil, Gum | 750 |
| Almond Oil, Glycerin | 620 |

Such concentrations highlight the differential solubility capabilities and stability of the respective oil combinations.

Titratable Acidity

Structural Analysis via FTIR

Wavenumber Observation:

This high wavenumber can partly attribute its presence to stretching vibrations common in carbonyl compounds, indicative of potential ester linkages.

pH Examination

A well-balanced pH was recorded for Almond Oil mixed with Vitamin E, implicating its potential stability in formulations.

NMR Spectroscopy Insights

Chemical Shift (ppm):

This chemical shift can be integral to understanding the hydrogen environment in these complex oils.

Viscosity Measurement

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| **Sample Composition** | **Viscosity (cP)** |
| Coconut Oil, Cetyl Alcohol | 5011.56 |
| Almond Oil | 7552.95 |

Interestingly, the pure Almond Oil’s viscosity was notably higher, a key factor to consider in potential applications.

Random Observations

Certain elements in the mixtures were observed to undergo peculiar changes. While assessing the analytical procedures, it was noted that the ambient temperature and humidity potentially influenced the reading variance. In an unrelated analysis, a peculiar blue tint manifested in a completely different mixture, implying cross-reactivity of compounds possibly outside the scope of this study.

Conclusion

The detailed examination of the mixtures has unveiled a multi-faceted understanding of the complex interactions within oil-based formulations. Distinguishing the nuance in each test result, this report provides insightful data pivotal for further research aimed at enhancing commercial application viability. Future investigations might delve deeper into the molecular alignment to optimize product formulation processes.