Lab Report: Characterization of Oil-Based Mixtures

Introduction

The aim of this series of experiments was to evaluate the properties of various oil-based mixtures using a range of analytical instruments. This study focused on mixtures containing components like Almond Oil, Coconut Oil, Jojoba Oil, Cetyl Alcohol, Glycerin, and other additives. Multiple tests were conducted to determine characteristics such as absorption, pH, conductivity, viscosity, and other molecular properties.

To ensure a comprehensive analysis, all samples were subjected to different analytical techniques. This report provides detailed outcomes and observations for each test performed, offering insights into the specific attributes of the samples.

Methods

Various instruments were utilized:

Sample Preparation

Each test sample was a specific combination of oils and additives, prepared to analyze how these components interact under various conditions.

Observations and Measurements

UV-Vis Spectrophotometer Analysis

Various samples were assessed to measure absorbance at specific wavelengths. The outcomes are encapsulated in Table 1.

Sample Combination	Instrument	Measurement Type	Value (Abs)
Almond Oil, Cetyl Alcohol, Glycerin	UV-Vis Spectrophotometer UV-2600	Absorbance	2.1
Jojoba Oil, Beeswax	UV-Vis Spectrophotometer UV-2600	Absorbance	2.8

Observation: Both samples demonstrated moderate absorbance, indicative of molecular interactions between the

components that absorb specific wavelengths of light.

pH Measurement

The pH levels of the mixtures provide insight into their chemical neutrality or acidity (Table 2).

Sample Combination	Instrument	Measurement Type	Value (pH)
Coconut Oil, Gum	pH Meter PH-700	pH Level	7.3

Observation: A pH of 7.3 suggests that the sample is near neutral, appropriate for various cosmetic applications.

Molecular and Structural Analysis

The characterization of molecular structures and affiliations was performed using FTIR and NMR.

Sample Combination	Instrument	Measurement Type	Wavenumber (1/cm)
Almond Oil, Gum	FTIR Spectrometer FTIR-8400	Wavenumber	1200
Sample Combination	**Instrument**	**Measurement Type**	**Chemical Shift (ppm)**
Coconut Oil, Glycerin	NMR Spectrometer NMR-500	Chemical Shift	8.5

Observations: FTIR results showed notable absorption around 1200 1/cm, hinting at ester functional groups, while the NMR shifts indicated unique proton environments characteristic of the molecular structure of the oils.

Conductivity and Spectrometry Outcomes

Conductivity values reveal the ionic conductance within the mixtures, while spectrometer readings highlight their spectral properties (Table 4).

Sample Combination	Instrument	Measurement Type	Value (uS/cm)
Jojoba Oil, Cetyl Alcohol, Glycerin	Conductivity Meter CM-215	Conductance	1500
Sample Combination	**Instrument**	**Measurement Type**	**Wavelength (nm)**
Coconut Oil, Beeswax	Spectrometer Alpha-300	Spectral Peak	550

Miscellaneous Analysis

Sample Combination	Instrument	Measurement Type	m/z
Coconut Oil	Mass Spectrometer MS-20	Mass-to-Charge	300

Viscosity Analysis

Complex viscosities measured across different mixtures are recorded below (Random clutter can be observed).

Viscometer:

Sample Combination	Instrument	Measurement Type	Viscosity (cP)
Almond Oil, Gum, Vitamin E	Viscometer VS-300	Viscosity	7643.05
Coconut Oil	Viscometer VS-300	Viscosity	5036.78
Almond Oil, Gum, Glycerin	Viscometer VS-300	Viscosity	8033.74

Conclusion

The analytical results from the diverse spectrum of instruments highlighted distinct properties of each oil-based mixture. This comprehensive analysis serves as a foundation for further exploration of these versatile formulations. Variances in chemical shifts, absorption spectra, and viscosity shed light on the interaction dynamics and characteristics of the individual components within these mixtures. These findings could behaviorally enhance and optimize formulation strategies, particularly in personal care and cosmetic applications.

Irrelevant Information: During the course of analysis, extraneous noise on the spectrometer was occasionally observed. An unrelated sample of olive oil from a prior experiment showed a bizarrely high absorbance, unrelated to the current study.

Overall, the compiled results underscore the importance of detailed and multifaceted approaches to characterizing oil-based products, providing a pathway for advanced material design and application.