

## Lab Report

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### Introduction

This report details the testing and analysis of various oil-based mixtures using advanced spectroscopic and chromatographic techniques. The primary goal was to identify the content and properties of mixtures prepared with Coconut Oil, Almond Oil, and Jojoba Oil as the main ingredients, in conjunction with additional components such as Cetyl Alcohol, Glycerin, Beeswax, and Vitamin E.

### Methods and Equipment

The following instruments were employed in the experimentation:

Each sample was meticulously prepared and subjected to the respective methodologies to quantify and qualify its constituent interactions and properties.

### Observations

The NMR indicated a resonance at 15 ppm, suggestive of possible interaction between components.

Sample: Coconut Oil, Cetyl Alcohol, Glycerin

FTIR spectroscopy identified significant peaks, notably at 1450 1/cm, confirming functionality compatibility.

Sample: Jojoba Oil, Vitamin E

HPLC established Vitamin E concentration at 25 mg/L, aligning with expected therapeutic levels.

Sample: Almond Oil, Cetyl Alcohol, Glycerin

Detected faint almond scent; Gas Chromatography confirmed Cetyl Alcohol presence with peak at 250 ppm.

Sample: Jojoba Oil without additives

Exhibited a viscosity measurement of 400 Pa-s as per the rheometric analysis.

Sample: Coconut Oil, Cetyl Alcohol, Vitamin E

X-Ray Diffraction revealed structural alterations at 120°C.

Sample: Coconut Oil, Beeswax, Glycerin

Electrical conductivity measured at 850 µS/cm, reflecting higher ionic interactions.

Viscosity Measurement

Results and Discussion

Table 1: Summary of Analytical Techniques and Key Observations

Technique	Sample Combination	Key Finding
NMR (NMR-500)	Coconut Oil, Vitamin E	Resonance at 15 ppm
FTIR (FTIR-8400)	Coconut Oil, Cetyl Alcohol, Glycerin	Peak at 1450 1/cm
HPLC (HPLC-9000)	Jojoba Oil, Vitamin E	25 mg/L Vitamin E
Gas Chromatograph (GC-2010)	Almond Oil, Cetyl Alcohol, Glycerin	Cetyl Alcohol at 250 ppm
Rheometer (R-4500)	Jojoba Oil	Viscosity at 400 Pa-s
X-Ray Diffractometer (XRD-6000)	Coconut Oil, Cetyl Alcohol, Vitamin E	Structural shift at 120°C
Conductivity Meter (CM-215)	Coconut Oil, Beeswax, Glycerin	850 µS/cm
Viscometer (VS-300)	Mixtures (Various)	Various viscosities

Table 2: Detailed Viscosity Analysis

Sample Mixture	Viscosity (cP)
Coconut Oil, Cetyl Alcohol, Vitamin E	5096.82
Jojoba Oil, Beeswax, Vitamin E	3015.2

The viscosity measurements suggest that the presence of Vitamin E and Cetyl Alcohol significantly influences the oil's viscosity, enhancing its potential application in cosmetic formulations that require stable emulsions.

## Conclusion

The detailed analysis provided insights into the intricate interactions occurring within oil-based cosmetic mixtures. NMR, FTIR, HPLC, and other techniques successfully confirmed the presence and quantified the concentration of various additives. The study indicates that Coconut Oil mixtures possess unique properties suitable for specific applications, while Jojoba Oil demonstrated considerable variations in viscosity due to its interaction with Beeswax. Future work could delve into temperature-dependent characteristics and further stability assessments for these formulations.