Lab Report: Analysis of Cosmetic Mixtures

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Introduction

This document provides a comprehensive analysis of various cosmetic formulations using state-of-the-art laboratory equipment. The aim is to characterize the physical and chemical properties of mixtures commonly used in skin care products, such as those containing oils, waxes, and alcohols.

Experiment Description

A variety of mixtures were subjected to multiple analytical techniques. These mixtures include combinations of natural oils, alcohols, waxes, glycerin, and vitamins. The techniques used for analysis were High-Performance Liquid Chromatography (HPLC), Spectrometry (both UV and Mass), Nuclear Magnetic Resonance (NMR), Conductivity Measurements, Rheometry, and Viscosity Analysis.

Observations and Methodology

Upon conducting the experiments, numerous observations were made regarding the interactions between the ingredients. Various lab instruments provided detailed insights into the molecular and chemical nature of the samples. Below, each mixture is addressed with corresponding experimental conditions and outcomes.

Sample Analysis

Table 1: High-Performance Liquid Chromatography (HPLC)

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Mixture** | **Concentration (mg/L)** |
| HPLC-9000 | Coconut Oil, Cetyl Alcohol, Glycerin | 525.4 |
| HPLC-9000 | Jojoba Oil, Gum, Glycerin | 678.9 |

Discussion:HPLC analysis indicates that the combination of Jojoba Oil, Gum, and Glycerin exhibits a higher concentration compared to the Coconut formulation. This suggests varying solubility profiles and interaction strengths among the ingredients.

Table 2: Spectrometer Analysis

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Mixture** | **Wavelength (nm)** |
| Alpha-300 | Jojoba Oil, Beeswax, Vitamin E | 850.3 |
| Alpha-300 | Almond Oil, Cetyl Alcohol, Glycerin | 320.7 |

Observation:The significant difference in wavelength absorption highlights distinct optical properties influenced by the nature of oil and the accompanying components.

Mass Spectrometer Findings

Table 3: Mass Spectrometry

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Mixture** | **m/z** |
| MS-20 | Almond Oil, Gum, Glycerin | 1495.7 |
| MS-20 | Almond Oil, Gum, | 1458.3 |

Note: Mass spectrometry results reveal the molecular weight distribution within Almond Oil based formulations.

Insight:The Gum component seems to contribute consistently across samples, however, its interaction with Glycerin yields heavier molecular fragments.

Table 4: NMR Spectroscopy

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Mixture** | **Chemical Shift (ppm)** |
| NMR-500 | Jojoba Oil, Cetyl Alcohol, Vitamin E | 13.8 |

Complex Analysis:Our NMR results showcase the chemical environment differences in the presence of alcohol and vitamin groups, affecting the electron shielding and thereby the observed shifts.

Table 5: Conductivity & Rheometry

|  |  |  |  |
| --- | --- | --- | --- |
| **Equipment** | **Mixture** | **Conductivity (uS/cm)** | **Viscosity (Pa-s)** |
| CM-215 | Jojoba Oil, Gum | 1125.6 | - |
| R-4500 | Jojoba Oil, Cetyl Alcohol | - | 250.2 |

Table 6: Viscosity Measurements

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Mixture** | **Viscosity (cP)** |
| VS-300 | Coconut Oil, Cetyl Alcohol, Vitamin E | 4959.46 |
| VS-300 | Almond Oil, Beeswax | 7100.58 |

Detailed Examination:Viscosity data emphasize the thicker nature of mixtures involving Beeswax compared to those with Vitamin E.

Conclusion

The experimental data provides insightful observations regarding the physicochemical attributes of each cosmetic mixture. Variations in concentration, wavelength absorption, mass, chemical environment, and rheological behavior are inherently tied to the specific combination of ingredients.

Future Directions:Additional research should explore the impact of varying temperature and pressure conditions on these formulations to better simulate real-world application scenarios.

Miscellaneous Note:To ensure data integrity and repeatability, future analyses should incorporate a broader range of instrumental calibration and cross-validation techniques for improved accuracy.

References:Data collected and recorded using Report\_2478 Lab Protocol Documentation. Analysis conducted using HPLC-9000, Alpha-300, MS-20, NMR-500, CM-215, and VS-300 under standard conditions.