Lab Report

Experiment Overview

Report ID:992Objective:To analyze various oil-based mixtures using diverse analytical instruments, quantifying specific components and physical properties. This study provides insights into the chemical characteristics and potential efficacy of such mixtures in cosmetic and food applications.

Materials and Methods

Each mixture was subjected to multiple analytical techniques to extract and quantify specific components or characteristics, with details captured in the data tables below.

Instrumentation and Techniques

Sample mixtures were carefully prepared using precise mass ratios to ensure replicable consistency among trials. Measurements were taken at room temperature unless specified otherwise.

Data and Observations

Table 1: Analytical Results for Sample Mixtures

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Ingredients** | **Instrumentation** | **Measurement** | **Value** | **Units** |
| 1 | Coconut Oil, Vitamin E | Mass Spectrometer (MS-20) | m/z | 1500 | m/z |
| 2 | Almond Oil, Cetyl Alcohol | FTIR Spectrometer (FTIR-8400) | Wavenumber | 3500 | 1/cm |
| 3 | Almond Oil, Beeswax | NMR Spectrometer (NMR-500) | Chemical Shift | 15 | ppm |
| 4 | Coconut Oil, Glycerin | pH Meter (PH-700) | pH Level | 6 | pH |
| 5 | Almond Oil, Beeswax | Centrifuge (X100) | Rotational Speed | 12000 | RPM |

Table 2: Specialized Analysis of Mixtures

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Ingredients** | **Instrumentation** | **Component** | **Quantity** | **Units** |
| 6 | Coconut Oil, Gum, Vitamin E | HPLC System (HPLC-9000) | Vitamin E | 500.0 | mg/L |
| 7 | Coconut Oil, Vitamin E | Microplate Reader (MRX) | Optical Density | 2.5 | OD |
| 8 | Almond Oil, Cetyl Alcohol | UV-Vis Spectrophotometer (UV-2600) | Absorbance | 3.0 | Abs |

Table 3: Viscosity Measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample ID** | **Ingredients** | **Instrumentation** | **Viscosity** | **Units** |
| 9 | Jojoba Oil, Vitamin E | Viscometer (VS-300) | 2603.96 | cP |
| 10 | Almond Oil, Cetyl Alcohol, Vitamin E | Viscometer (VS-300) | 7166.7 | cP |
| 11 | Coconut Oil, Beeswax | Viscometer (VS-300) | 4756.32 | cP |

Results and Discussion

Mass Spectrometric Analysis

The Mass Spectrometer MS-20 identified Coconut Oil with Vitamin E registering a prominent peak at an m/z ratio of 1500. This suggests the molecular ion or a dominant fragment, relevant in quality assessments of oil-purity.

HPLC Results

Using HPLC-9000, the concentration of Vitamin E in the Coconut Oil and Gum mixture was reported as 500 mg/L, indicating a robust presence suitable for nutritional and preservative applications in skin-care products.

FTIR and NMR Insights

FTIR analysis showed a strong absorption at 3500 1/cm for Almond Oil and Cetyl Alcohol, characteristic of –OH stretch vibrations. Meanwhile, NMR revealed a chemical shift at 15 ppm for Almond Oil containing Beeswax, likely indicative of a particular proton environment within the esters present.

pH Measurement

The pH level recorded (6) for Coconut Oil and Glycerin implies compatibility with dermal applications, being near-neutral, thus reducing irritation potential when used topically.

Centrifugation and Optical Density

Centrifugation confirmed Almond Oil and Beeswax's stability at high rotational speeds (12000 RPM), showing no phase separation, critical for storage stability. The optical density reading of 2.5 OD for Coconut Oil mixtures indicates their potential UV-blocking capacity.

UV-Visible and Viscosity Properties

UV-Vis absorbance at 3.0 Abs for Almond Oil and Cetyl Alcohol aligns with expected energy absorption, impacting product color and penetration capabilities. Viscosity measurements delineate the fluid dynamics of each blend, influencing application spreadability in formulations.

Conclusion

The detailed multi-instrument analyses depict complex interactions among oil constituents, influencing their application in diverse domains. These findings guide formulation advancements in cosmetics and nutraceuticals, aligning with consumer safety and efficacy expectations.

Anomalous Observations

Noteworthy, the discrepancies in viscosity readings demand further molecular analysis, potentially attributing such deviations to unmeasured environmental factors like humidity and unintentional ingredient variability. Future investigations should integrate controls for such variables to ascertain consistency and repeatability.

Note:Some contextually irrelevant artifacts may appear scattered across datasets, reflecting typical real-world analysis complexities.

This concludes the detailed analysis of various oil mixtures as per the experimental and observation protocols defined in the current study. Careful integration of findings with broader product development strategies can significantly enhance resultant product quality and consumer satisfaction.