Lab Report 1555

Objective:The goal of this report is to analyze the chemical properties of various oil mixtures using advanced instrumentation. Each mixture's components are tested to obtain detailed insights into their physicochemical properties.

Introduction

In the pursuit of understanding the complex interactions and properties of oils and accompanying substances such as gums, waxes, and vitamins, various analytical techniques were employed. This study focuses on mixtures containing Jojoba Oil, Coconut Oil, and Almond Oil, among other components. Each test was carefully designed to yield precise data.

Materials and Methods

Instruments Used:

Sample Preparations:

Each sample was prepared using specified components:  
- Jojoba Oil or Coconut Oil or Almond Oil  
- Additives like Gum, Beeswax, Glycerin, and Vitamin E

The following tables provide an overview of the observations:

Table 1: pH Measurements

|  |  |  |
| --- | --- | --- |
| **Sample (Ingredients)** | **pH Meter** | **pH Value (pH)** |
| Jojoba Oil, Gum, Glycerin | PH-700 | 6.5 |
| Almond Oil, Beeswax, Vitamin E | PH-700 | 7.1 |

Table 2: Conductivity Measurements

|  |  |  |
| --- | --- | --- |
| **Sample (Ingredients)** | **Conductivity Meter** | **Conductivity (µS/cm)** |
| Almond Oil, Glycerin | CM-215 | 345 |

Results

Table 3: Optical Density

|  |  |  |
| --- | --- | --- |
| **Sample (Ingredients)** | **Microplate Reader** | **Optical Density (OD)** |
| Coconut Oil, Beeswax, Glycerin | MRX | 1.2 |

Table 4: NMR Spectroscopic Analysis

|  |  |  |
| --- | --- | --- |
| **Sample (Ingredients)** | **NMR Spectrometer** | **Peak (ppm)** |
| Coconut Oil, Gum, Vitamin E | NMR-500 | 5.7 |

Table 5: Chromatographic Analysis

|  |  |  |
| --- | --- | --- |
| **Sample (Ingredients)** | **Chromatograph** | **Concentration (Units)** |
| Almond Oil, Gum | IC-2100 | 2.3 mM |
| Coconut Oil, Beeswax, Vitamin E | LC-400 | 78.5 µg/mL |

Table 6: Viscosity Measurements

|  |  |  |
| --- | --- | --- |
| **Sample (Ingredients)** | **Viscometer** | **Viscosity (cP)** |
| Jojoba Oil, Gum, Vitamin E | VS-300 | 2202.28 |
| Almond Oil, Gum | VS-300 | 7708.17 |

Discussion

ThepHandconductivityresults obtained suggest that the mixtures containing Vitamin E tend to be more basic, as observed with the Almond Oil blend. Interestingly, glycerin presence in almond-based samples increased conductivity significantly. This may imply ionic strength adjustments due to glycerin interactions. However, the direct correlation between pH and conductivity is not evident here.

TheNMRdata provided unique insights into the molecular resonance frequency, notably for Coconut Oil mixtures, indicating aromatic shifts that are characteristic for Vitamin E incorporation.

Optical Density measurements supplemented our understanding, with the Glycerin presence contributing to increasedODvalues, showcasing its viscosity and refractive interferences.

The use ofChromatographyfurther delineated the molecular composition differences with a markedly higher concentration of Vitamin E derivative observed in the Coconut Oil and Beeswax matrix.

Remarkably, theviscositymeasurements presented an intriguing contrast. The Almond Oil and Gum mixture had significantly higher viscosity, highlighting the molecular interaction strengths within this combination.

Conclusions

This study exemplifies the diverse properties of oil-based compositions. Each dataset contributes to a broader understanding of material interactions, resistance to flows, and other physicochemical properties. Further exploration with larger sample sizes and different concentrations could illuminate additional interaction pathways and potential applications in pharmaceutical and cosmetic industries.

Annex: Miscellaneous Observations

Some irrelevant yet notable observations include a sporadic structure formation noticed during the pH balance adjustments. Such phenomena deserve further investigation, albeit their direct relevance to this study remains minimal.

The instrumental settings for all devices were standardized, although intermittent recalibration was required during data acquisition, particularly for the NMR and Chromatography systems, hinting at underlying hardware resilience issues.

Note:Data has been presented in a challenging manner to underscore the need for careful extraction and analysis, ensuring that critical information is not inadvertently overlooked or misrepresented.