Lab Report: Complex Mixture Analysis – Report ID: 1091

Introduction

This report documents the analytical testing of several formulations comprising Jojoba Oil, Almond Oil, and various additives such as Cetyl Alcohol, Vitamin E, Gum, Beeswax, and others. Each formulation was analyzed for different properties using multiple instruments, including rheometry, NMR spectroscopy, mass spectrometry, pH measurement, and X-ray diffraction. The testing aimed to determine the physical and chemical characteristics of each formulation.

Materials and Methods

Multiple laboratory techniques were employed to evaluate the complex mixtures. The key methodologies include:

Results and Discussion

Table 1: Rheological and Chemical Shift Analysis

|  |  |  |
| --- | --- | --- |
| **Ingredients** | **Viscosity (Pa-s)** | **Chemical Shift (ppm)** |
| Jojoba Oil, Cetyl Alcohol, Vitamin E | 502.3 | 5.6 |
| Almond Oil, Cetyl Alcohol | 823.9 | 12.4 |
| Almond Oil, Gum, Vitamin E | 678.5 | 13.2 |
| Almond Oil, Beeswax | 435.9 | 3.7 |
| Jojoba Oil | 287.6 | 9.1 |

Table 2: Mass and pH Measurements

|  |  |  |
| --- | --- | --- |
| **Ingredients** | **Mass (m/z)** | **pH** |
| Jojoba Oil, Cetyl Alcohol, Vitamin E | 185.7 | 6.8 |
| Almond Oil, Cetyl Alcohol | 773.5 | 7.1 |
| Almond Oil, Gum, Vitamin E | 1204.3 | 5.5 |
| Almond Oil, Beeswax | 798.4 | 6.3 |
| Jojoba Oil | 354.9 | 7.9 |

Table 3: X-Ray Diffraction and Viscosity

|  |  |  |
| --- | --- | --- |
| **Ingredients** | **XRD (C)** | **Viscosity (cP)** |
| Jojoba Oil, Cetyl Alcohol, Vitamin E | 152.4 | - |
| Almond Oil, Cetyl Alcohol | 98.7 | - |
| Almond Oil, Gum, Vitamin E | 74.8 | - |
| Almond Oil, Beeswax | 165.2 | - |
| Jojoba Oil | 130.5 | 2674.86 (with Vitamin E) |
| Coconut Oil, Glycerin | - | 4938.35 |

Observations

The Jojoba Oil, when combined with Cetyl Alcohol and Vitamin E, exhibited a moderate viscosity of 502.3 Pa-s and a chemical shift of 5.6 ppm. Interestingly, the presence of Vitamin E also altered the XRD measurements significantly. For Almond Oil-based mixtures, the incorporation of Gum and Vitamin E resulted in the highest mass spectrometry reading at 1204.3 m/z and demonstrated reduced pH.

Almond Oil, when mixed with Beeswax, showed enhanced crystalline structures as evident from XRD readings. However, Jojoba Oil alone maintained a balanced pH environment, indicative of its stable chemical nature.

Irrelevant Observations

During the experimentation, an unrelated observation was made in the adjacent lab on the crystallization behavior of table salt in cold solutions, which is immaterial to this report. Additionally, rainfall patterns observed from the lab window did not affect the testing conditions.

Conclusion

The comprehensive analysis of Jojoba and Almond Oil mixtures with various additives revealed significant insights:

Viscosity Variance: Jojoba-based mixes displayed slightly lower rheological properties than Almond-based formulations, indicating potential differences in application behavior.

Mass Spectral Diversity: The mixtures possessed varied molecular masses, underscoring the complexity introduced by different additives.

pH Stability: Jojoba Oil displayed consistent pH levels, suggesting potential advantages in formulations requiring stability.

This intricate analysis advances the understanding of the interplay between oil types and additives, providing valuable data for future formulation improvements.

This report intentionally incorporates complex tables and descriptions to ensure robust human understanding over automated data extraction.