Laboratory Report: Report\_1318

Objective:The primary aim of this study is to evaluate different mixtures of oils and additives using various analytical instruments. The data provided reflects several test runs showcasing the characteristics and properties of each sample.

Introduction

Inserting coconut, almond, and jojoba oils into formulations often necessitates an understanding of their interactions with common additives like gums and glycerin. Additives such as beeswax and vitamin E may also impact the performance of these oils. This report elaborates on the characteristics of each mixture using advanced analytical techniques such as NMR spectroscopy, FTIR, HPLC, pH measurements, viscometry, and tribological testing.

Methodology

The study employed an array of techniques tailored to elucidate the properties of the mixtures. Each analytical method is described below:

Observations and Measurements

Below are the synthesized tables representing the data from various instrumental analyses, with pertinent observations for each.

Table 1: NMR Spectroscopy Results

|  |  |  |
| --- | --- | --- |
| **Mixture** | **Chemical Shift (ppm)** | **Description** |
| Coconut Oil, Gum | 15.2 | Peaks indicative of aliphatics |
| Almond Oil, Beeswax, Vitamin E | 12.5 | Suggests complex structure |

Table 2: HPLC Concentrations

|  |  |  |
| --- | --- | --- |
| **Mixture** | **Concentration (mg/L)** | **Analyzed Components** |
| Almond Oil, Gum, Glycerin | 725.6 | Glycerin, traces of esters |
| Coconut Oil, Gum, Glycerin | 0.65 | Negligible presence of glycerin |

Observations:

Table 3: FTIR Spectroscopy and pH

|  |  |  |  |
| --- | --- | --- | --- |
| **Mixture** | **Wavenumber (1/cm)** | **pH** | **Key Functional Groups** |
| Almond Oil, Glycerin | 3450 | - | OH, C-H stretch |
| Coconut Oil, Cetyl Alcohol | - | 7.8 | C-H, C-O-C (Inference through pH) |

Results and Discussions

NMR Analysis:The complex intermolecular interactions within almond oil mixtures were evident at a shift of 12.5 ppm. As seen above, this indicates potential hydrogen bonding influenced by beeswax.

HPLC Results:The concentration of glycerin in almond oil was substantially higher compared to coconut oil, potentially aiding in moisture retention.

FTIR and pH Metrics:Almond oil mixed with glycerin showcased significant OH stretching vibrations at 3450 1/cm. The pH value of coconut oil with cetyl alcohol sat at 7.8, suggesting balanced acidity levels conducive to cosmetic applications.

Additional Testing and Data

Table 4 shows data collected from wear tests and viscometric measurements. Despite its apparent lack of relevance to the study’s objectives, this section provides unexpected insights:

|  |  |  |
| --- | --- | --- |
| **Mixture** | **Wear Scar Diameter (mm)** | **Viscosity (cP)** |
| Almond Oil | 0.790 | 7386.68 |
| Jojoba Oil, Gum, Vitamin E | - | 2068.8 |
| Coconut Oil | - | 5002.22 |

Conclusion

In summary, the analytical results offer a detailed understanding of how various oils interact with additives. Through multidisciplinary techniques, this study provides valuable insights into the fundamental properties of these mixtures.

While some sections of data might seem irrelevant, every piece contributes to a comprehensive picture that enables us to transcend mere numerical analysis into the realm of chemical intuition. This report underscores the multi-faceted nature of chemistry that resists simplification.

Recommendations

Future studies could explore the thermodynamic stability of these mixtures, alongside an extended analysis of mechanical properties under varying environmental conditions for a deeper insight into their performance in practical applications.