Laboratory Report: Analysis of Various Oil and Additive Mixtures

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Introduction

This lab report presents the analyses performed on various oil mixtures using advanced analytical equipment. The primary objective was to determine the physicochemical properties and constituent concentration of oils blended with various additives such as Cetyl Alcohol, Vitamin E, Beeswax, and others. Each mixture was treated as a unique sample and assessed using multiple instruments, including HPLC, X-ray Diffractometer, and others.

Sample Descriptions

Methods and Observations

Instrumentation and Techniques

Mixed Method Observations

Sample C, a complex mixture with three components, presented unique centrifugation patterns, indicating phase separation at 5000 RPM. In contrast, Sample D, although simpler, demonstrated distinct chromatographic behavior using the HPLC System, reflecting purity levels of Vitamin E.

Table 1: Equipment Utilization and Sample Observations

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Sample** | **Components** | **Observation** |
| HPLC System HPLC-9000 | A | Almond Oil, Cetyl Alcohol, Vitamin E | Measured 250/350 mg/L Vitamin E |
| X-Ray Diffractometer XRD-6000 | B | Jojoba Oil, Cetyl Alcohol, Vitamin E | Peak at 120°C, indicating crystalline state |
| Centrifuge X100 | C | Coconut Oil, Cetyl Alcohol, Glycerin | Phase separation at 5000 RPM |
| PCR Machine PCR-96 | C | Coconut Oil, Cetyl Alcohol, Vitamin E | Ct value of 28 |
| Four Ball FB-1000 | A | Almond Oil, Vitamin E | Wear scar diam. of 0.750 mm |

Complex Analyses

In an unexpected turn of events, the Mass Spectrometer MS-20 registered an m/z ratio of 850 for Sample D. Conversely, Sample E's viscometry analysis at 7332.48 cP for Almond Oil with Beeswax and Glycerin exhibited an unusual rise in viscosity, potentially due to additive interactions.

Results and Discussions

HPLC and Titration Outcomes

The results illustrate that certain ingredients like Vitamin E fare better in higher concentrations (350 mg/L in Almond Oil mixtures). However, when compounded with different bases like Jojoba Oil, the absorption characteristics shift as seen with the UV-Vis Spectrophotometer, marking an absorbance of 1.2 although data errors were detected during peak analysis.

Table 2: Concentration Measurements and Viscosity Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Instrument** | **Measurement** | **Unit** |
| A | HPLC-9000 | 250/350 | mg/L |
| C | Titrator T-905 | 0.005 | M |
| B | UV-Vis Spectrophotometer UV-2600 | 1.2 | Abs |
| E | Viscometer VS-300 | 7332.48 | cP |
| F | Viscometer VS-300 | 5301.05 | cP |

Erroneous Data and Anomalies

During the experiment, irrelevant discrepancies surfaced—random m/z values, unexpected Ct levels, and viscosity fluctuations—necessitating further investigation. Especially noteworthy was the Ion Chromatograph IC-2100 readout, incorporating irrelevant data but confirming Vitamin E concentration at 15 mM for Coconut Oil mixtures.

Conclusion

The comprehensive assessment of various oil mixtures has unveiled critical insights into their compositional characteristics. Despite the presence of anomalies, the experimental data aligns partially with predicted results. Future work should focus on refining analytical methodologies to mitigate data disparities and enhance accuracy.

Further Recommendations:Collaborate on potential scale-up processes and examine synergistic blend effects with new chemical additives. Possible integration of AI-driven analysis for error mitigation and pattern recognition in complex datasets.