Lab Report: Complex Analysis of Oil Samples

Report ID:291Date:[Insert date]

Introduction

The primary objective of this laboratory analysis was to evaluate the physical and chemical properties of various oil-based mixtures using a range of advanced instrumentation techniques. Mixtures containing different oils and additives were analyzed for their tribological performance, chemical composition, optical properties, and viscosities.

Materials and Methods

Different instrumental techniques were utilized:

Experimental Samples

Each set of ingredients was tested as a single sample. The following is a description of the samples analyzed:

Measurements and Observations

The data collected from each instrument are tabulated below. Note that some information in Table 1 and Table 2 may seem irrelevant but serves to provide a comprehensive scope of the study:

Table 1: Tribological and Chemical Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Sample Components** | **Measurement** | **Unit** |
| Four Ball FB-1000 | Jojoba Oil, Gum | 0.3 | mm |
| Four Ball FB-1000 | Jojoba Oil, Beeswax | 0.5 | mm |
| Mass Spectrometer MS-20 | Almond Oil, Vitamin E | 1200.0 | m/z |
| Mass Spectrometer MS-20 | Coconut Oil | 1800.0 | m/z |

Table 2: Optical Properties and Viscosity

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Sample Components** | **Measurement** | **Unit** |
| Spectrometer Alpha-300 | Coconut Oil, Cetyl Alcohol, Vitamin E | 800.0 | nm |
| Spectrometer Alpha-300 | Coconut Oil, Beeswax | 500.0 | nm |
| UV-Vis Spectrophotometer UV-2600 | Jojoba Oil, Vitamin E | 1.5 | Abs |
| UV-Vis Spectrophotometer UV-2600 | Jojoba Oil, Glycerin | 2.0 | Abs |

Table 3: Viscosity Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Sample Components** | **Measurement** | **Unit** |
| Viscometer VS-300 | Jojoba Oil, Vitamin E | 2599.39 | cP |
| Viscometer VS-300 | Almond Oil, Glycerin | 7625.65 | cP |

Results and Discussion

Tribological Performance:The Four Ball test results indicate that Jojoba Oil with Gum exhibited lower wear (0.300 mm) compared to the addition of Beeswax (0.500 mm). This suggests that the lubricating properties are significantly influenced by the type of additive used.

Chemical Composition:Mass spectrometry revealed distinct mass-to-charge ratios, with Almond Oil and Vitamin E showing a moderate m/z value of 1200, whereas Coconut Oil alone presented a higher m/z of 1800. This reflects the variance in molecular architecture between the samples.

Optical Properties:Spectrometry analysis displayed peaks at 800 nm for mixtures involving Vitamin E, indicating significant absorption in the near-IR range. Conversely, Beeswax combinations demonstrated absorbance at 500 nm, pointing to their differential optical behavior.

Viscosity Measurements:Viscosity was substantially greater in Almond Oil mixtures, particularly with Glycerin, recording 7625.65 cP. This contrasts with Jojoba Oil mixtures, which exhibited much lower viscosities, suggesting variations in intermolecular interactions.

Conclusion

This comprehensive analysis of oil-based mixtures illustrates the distinct physical and chemical properties imparted by different additives. Integration of multi-instrumental approaches allows for a holistic evaluation of material characteristics which is crucial for applications like lubrication and cosmetics. Future studies could explore the influence of temperature variation on these properties to further enhance understanding and application flexibility in industrial scenarios.