Lab Report 873: Analysis of Oil Mixtures

Introduction

This report details a series of analytical tests conducted on various oil mixtures using sophisticated laboratory equipment. The primary goal was to ascertain diverse physical and chemical properties of each mixture, enhancing our understanding of their potential applications and behaviors under specific conditions.

Equipment and Methodology

Equipment Utilized

Methodological Outline

Each mixture was subjected to several testing procedures to analyze different properties, such as concentration, spectral data, wear resistance, stability, heat tolerance, and viscosity. Below are the detailed descriptions and results of the tests performed.

Results and Discussion

Ion Chromatograph Analysis

The Ion Chromatograph IC-2100 was employed to determine the concentration of specific compounds in the samples.

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| **Sample ID** | **Species Detected** | **Concentration (mM)** |
| Almond Oil + Cetyl Alcohol | Cetyl Alcohol | 0.085 |
| Coconut Oil + Cetyl Alcohol + Vitamin E | Cetyl Alcohol, Vitamin E | 0.092 |

The concentration measurements indicate effective separation and detection, suggesting the efficiency of the chromatographic method used.

FTIR Spectroscopy

The FTIR-8400 spectrometer provided insights into molecular structures and bonding types within the samples.

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| **Sample ID** | **Frequency Observed (1/cm)** |
| Coconut Oil | 3200 |

The observed wavenumber (3200 1/cm) is indicative of O-H stretching vibrations, typically present in hydroxyl-containing compounds.

Wear Resistance Testing (Four Ball Method)

The wear resistance of the mixtures was assessed using the Four Ball FB-1000 equipment.

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| **Sample ID** | **Test Substance 1** | **Test Substance 2** | **Wear Scar Diameter (mm)** |
| Jojoba Oil + Gum + Vitamin E | Jojoba Oil | Gum, Vitamin E | 0.65 |

The wear scar diameter indicates moderate protective attributes in the presence of Vitamin E.

Centrifuge Stability

Centrifuge X100 assessed the stability of emulsions formed by differing oil mixtures.

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| **Sample ID** | **Rotation Speed (RPM)** |
| Jojoba Oil + Beeswax | 13000 |

The high RPM value suggests robust emulsion stability, maintaining phase integrity under centrifugal stress.

Thermal Analysis via X-Ray Diffraction

X-Ray Diffractometer XRD-6000 was used to evaluate temperature-related structural changes.

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| **Sample ID** | **Temperature (°C)** |
| Jojoba Oil | 75 |

The evaluated temperature reflects the threshold at which potential crystalline transformations may occur.

Viscosity Measurement

Viscosity was measured by Viscometer VS-300, providing data vital for application considerations.

Observations:

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| --- | --- |
| **Sample ID** | **Viscosity (cP)** |
| Coconut Oil + Beeswax + Vitamin E | 4575.91 |
| Jojoba Oil + Vitamin E | 2631.97 |

The viscosity differences highlight how chemical composition affects flow characteristics.

Irrelevant Supplementary Information

Conclusion

In conclusion, the detailed examination of these mixtures revealed diverse characteristics, with significant variations dependent on the combination of ingredients. These findings contribute valuable insights into the potential applications of these oil blends, from wear resistance to thermal stability.

Overall, the collaboration and integration of multiple analytical techniques present a holistic view of the physiochemical profiles pertinent to industrial utilization.