Laboratory Analysis Report

Report ID: 1135

Date:March 15, 2023Laboratory:Advanced Materials Testing Facility

Executive Summary

The purpose of this report is to evaluate various oil and additive mixtures using advanced analytical techniques. Several mixtures of organic oils with different additives were subjected to tribological, spectrometric, chromatographic, viscometric, and other analyses to determine their wear resistance, optical properties, composition, and viscosity. The following detailed report includes insights, measurements, experimental conditions, and accompanying observations from each test.

Introduction

Analyzing the properties of oil-based mixtures is critical for understanding their potential applications. A total of 13 experimental tests were conducted using diverse analytical methods to investigate specific characteristics of compounds such as Jojoba Oil, Almond Oil, and Coconut Oil, combined with additives like Vitamin E, Beeswax, Cetyl Alcohol, and Glycerin.

Materials and Methods

The methods utilized in this study include:

Each mixture was prepared using precise aliquots of oils and additives, then subjected to the above analyses following industry-standard protocols.

Results and Observations

Wear Resistance Analysis

Table 1: Four Ball Wear Test Results

|  |  |  |
| --- | --- | --- |
| **Sample Mixture** | **Description** | **Wear Scar Diameter (mm)** |
| Jojoba Oil, Vitamin E | With Vitamin E | 0.5 |
| Almond Oil | No Additive | 0.75 |
| Jojoba Oil | No Additive | 0.65 |

Note: The wear scar was smallest with the inclusion of Vitamin E, indicating enhanced wear resistance.

Optical Properties

Table 2: Spectrometric Analysis

|  |  |  |
| --- | --- | --- |
| **Sample Mixture** | **Description** | **Wavelength (nm)** |
| Jojoba Oil, Beeswax, Glycerin | Complex blend | 250 |
| Jojoba Oil, Cetyl Alcohol | No Glycerin | 450 |

Observation: The optical properties differed significantly between samples, suggesting varied light absorption due to additive presence.

Chemical Composition

Table 3: Liquid Chromatograph Data

|  |  |  |
| --- | --- | --- |
| **Sample Mixture** | **Compound Identified** | **Concentration (ug/mL)** |
| Jojoba Oil, Cetyl Alcohol, Glycerin | Glycerin | 35 |
| Jojoba Oil, Cetyl Alcohol, Vitamin E | Vitamin E | 55 |

The concentration of additives varied, with Vitamin E present at a higher concentration than Glycerin.

Structural Analysis

Table 4: X-Ray Diffraction Results

|  |  |  |
| --- | --- | --- |
| **Sample Mixture** | **Component** | **Temperature (°C)** |
| Coconut Oil, Beeswax | Simple Compound | 100 |

Interpretation: The structural integrity of Beeswax contributes to stability at measured temperatures.

Volatility Assessment

Table 5: Gas Chromatography

|  |  |  |
| --- | --- | --- |
| **Sample Mixture** | **Description** | **Volatility (ppm)** |
| Jojoba Oil, Vitamin E | Low Volatility | 0.3 |
| Almond Oil | High Volatility | 0.8 |

Findings: Almond oil exhibited higher volatility compared to Jojoba oil mixtures with Vitamin E.

Viscometric Properties

Table 6: Viscosity Measurements

|  |  |  |
| --- | --- | --- |
| **Sample Mixture** | **Additives** | **Viscosity (cP)** |
| Almond Oil | Gum, Glycerin | 7668.77 |
| Coconut Oil | Cetyl Alcohol, Glycerin | 5124.67 |
| Coconut Oil | Cetyl Alcohol, Vitamin E | 5026.55 |

Insight: The inclusion of Glycerin significantly impacts viscosity, making mixed oils thicker and more resistant to flow.

Conclusion

This comprehensive series of tests demonstrated that the presence of additives notably influences the physical, chemical, and optical properties of oil mixtures. The protective qualities of Vitamin E and structural impacts of Beeswax offer significant advantages under specific conditions. These findings provide invaluable insights for future formulation of oil-based applications, optimizing performance parameters tailored to industrial needs.

Recommendations

Further studies should investigate long-term stability and broader spectrometric properties, ensuring the formulations meet desired industry standards for health, safety, and environmental compliance.

Prepared by: [Your Name]Laboratory Analyst