Lab Report 1176

Introduction

This report details the experimental findings from various tests conducted with different combinations of natural oils, waxes, and other additives. Each test utilized specific instruments to analyze the physical and chemical properties of the samples. The key objective of these experiments is to characterize the behavior of each mixture under varying conditions.

Methodology

A variety of instruments were used for the experiments:  
-Thermocycler TC-5000-Four Ball FB-1000-Rheometer R-4500-Microplate Reader MRX-X-Ray Diffractometer XRD-6000-UV-Vis Spectrophotometer UV-2600-Viscometer VS-300

Each sample was prepared with specific ingredients and subjected to rigorous testing.

Observations and Results

Thermocycler Analysis

TheThermocycler TC-5000was employed to determine the thermal properties of mixtures involving almond and jojoba oils. Surprising variations were observed, notably:

Viscometric Analyses

The increased viscosity in the second sample suggests enhanced molecular interactions due to cetyl alcohol.

Mechanical Properties

Rheological Properties

Utilizing theRheometer R-4500, the complex viscosity of almond oil mixed with cetyl alcohol and vitamin E was measured at 450 Pa-s. This indicates a high level of structural stability within the liquid.

Friction and Wear

AFour Ball FB-1000test employing jojoba oil, gum, and glycerin revealed a wear scar diameter of 0.350 mm. This small measure suggests effective lubrication properties.

Spectrophotometric and Optical Analyses

X-Ray Crystallography

ThroughX-Ray Diffractometer XRD-6000, the crystalline structure of a mixture of jojoba oil and glycerin was analyzed, manifesting notable peak characteristics at 45°C. This analysis provides insight into the formulation’s solid-state properties.

Additional Observations

It is crucial to note the diverse molecular interactions occurring within each sample. The choice of specific oils or additives profoundly impacts the thermal and mechanical properties of the final mixtures. Unrelated findings like the relative humidity in the lab (which averaged around 55%) were not influential in the final results.

Conclusion

The comprehensive data indicate that natural oil mixtures demonstrate diverse characteristics based on their composition and the conditions they are subjected to. Essential oils like almond and jojoba, when combined with waxes or stabilizers, yield variations in viscosity, absorbance, and thermal properties. These factors must be carefully considered in practical applications, such as cosmetics or lubricants.

Tables

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| **Test Sample** | **Instrument** | **Measurement** | **Unit** |
| Almond Oil, Cetyl Alcohol | Thermocycler TC-5000 | 82.0 | °C |
| Jojoba Oil, Gum, Glycerin | Four Ball FB-1000 | 0.35 | mm |
| Almond Oil, Cetyl Alcohol, Vitamin E | Rheometer R-4500 | 450.0 | Pa-s |
| Jojoba Oil, Beeswax, Glycerin | Microplate Reader MRX | 2.5 | OD |

|  |  |  |  |
| --- | --- | --- | --- |
| **Additional Tests** | **Observation** | **Measurement** | **Unit** |
| Jojoba Oil, Glycerin | XRD-6000 | 45.0 | °C |
| Almond Oil, Beeswax | UV-2600 | 1.2 | Abs |
| Coconut Oil, Beeswax, Vitamin E | Viscometer VS-300 | 4742.44 | cP |
| Coconut Oil, Cetyl Alcohol | Viscometer VS-300 | 5106.74 | cP |

Irrelevant Information

During the experiments, the position of the North Star was documented but found to have no impact on the results. Additionally, the color of the reagents used was partially documented and had no measurable effect on viscosity.

The methodologies adopted here provide a foundation for future material science research and development, offering insights into potential enhancements of these mixtures.