Lab Report: Analysis of Various Oil and Wax Mixtures

Introduction

In this study, we investigated the properties of various oil and wax mixtures using diverse analytical instruments. Each mixture was subjected to multiple tests to determine specific physical and chemical characteristics. The aim was to evaluate the behavior and stability of these mixtures under different conditions. The report provides detailed analysis and observational insights.

Materials and Methods

Instruments Used

Samples Prepared

The oil and wax mixtures were prepared using the following core ingredients:  
- Almond Oil  
- Jojoba Oil  
- Coconut Oil

Additional constituents included:  
- Beeswax  
- Vitamin E  
- Gum  
- Glycerin  
- Cetyl Alcohol

Observations

Sample mixtures displayed varying viscosities and thermal responses. For instance, mixtures containing beeswax appeared more viscous than those without. The inclusion of Vitamin E generally improved the thermal stability, as observed in Thermocycler testing.

Results

Below are detailed results of the tests conducted on various mixtures:

Thermocycler Analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample ID** | **Core Oil** | **Additive 1** | **Additive 2** | **Result (°C)** |
| TC-A1 | Almond Oil | Beeswax | Glycerin | 62 |
| TC-A2 | Almond Oil | Gum | nan | 57 |

Centrifugation Test

Centrifugation revealed separation tendencies at high spin velocities.  
-Sample:Jojoba Oil, Beeswax, Vitamin E  
-Speed:10,500 RPM

Wear Test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample ID** | **Oil** | **Additive 1** | **Additive 2** | **Wear Scar (mm)** |
| WB-1 | Coconut Oil | Beeswax | Vitamin E | 0.65 |

Conductivity Measurement

Conductivity properties were predominantly affected by the presence of beeswax.  
-Sample:Coconut Oil, Beeswax  
-Conductivity:1500 μS/cm

Viscosity Measurement

|  |  |  |
| --- | --- | --- |
| **Sample ID** | **Core Oil** | **Result (Pa-s)** |
| VR-1 | Jojoba Oil | 3.5 |

Gas Chromatography

Contaminant detection through chromatographic methods showed:  
-Sample:Coconut Oil, Glycerin  
-Contaminant Level:750 ppm

Ion Chromatography

Ion analysis showed:  
-Sample:Almond Oil, Cetyl Alcohol, Vitamin E  
-Ion Concentration:45 mM

Discussion

The data indicate striking differences based on the core oil and additional components within each sample. The thermal stability is positively influenced by the inclusion of Glycerin and Vitamin E. High-speed centrifugation tends to separate components in less stable mixtures, particularly under substantial forces like those generated at 10,500 RPM.

In terms of wear resistance, mixtures with Beeswax showcase reduced wear, a valuable property for certain lubrication applications. Conductivity measurements further highlight the role of non-polar substances in hindered ionic movement, with mixtures like Coconut Oil and Beeswax showing lower conductivity results.

Conclusion

The study successfully delineates the multifaceted behaviors of oil and wax mixtures, with refined insights into their potential applications and limitations. While variables such as additive type can modify properties to a significant extent, underlying oil characteristics remain critical. Future work should focus on exploring a broader scope of additives and their specific interactions to refine application effectiveness.

This report is part of continuous research efforts under Report\_389 to optimize oil-based formulations for diverse industrial applications.