Lab Report: Analysis of Various Oil Mixtures

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Abstract

This report presents the comprehensive analysis of different oil mixtures using a variety of advanced instrumentation techniques. The samples comprised combinations of natural oils and waxes, supplemented with additional additives. Techniques included Fourier Transform Infrared (FTIR) Spectrometry, X-Ray Diffraction (XRD), Conductivity Measurement, Ion Chromatography (IC), Four Ball Test, and Viscosity Measurement.

Introduction

In recent years, the use of natural oils, waxes, and related substances has gained significant research interest due to their applications. The components tested include Jojoba Oil, Beeswax, Almond Oil, Coconut Oil, Cetyl Alcohol, Glycerin, and Vitamin E, known for their unique physicochemical properties. This study aims to evaluate these mixtures under various conditions using state-of-the-art instruments.

Materials and Methods

Instruments Utilized

Sample Composition

The samples tested comprised various combinations of oils, waxes, and additives, each noted by distinct sample IDs. Some notable examples include:- Jojoba Oil with Beeswax and Vitamin E- Almond Oil with Gum and Vitamin E- Coconut Oil with Beeswax and Glycerin

Results

Table 1: FTIR Spectrometer Analysis| Sample ID | Ingredients | Wavenumber (1/cm) | Observations |  
|-------------------|-------------------------------------|-----------------|-----------------------------|  
| Jojoba Beewax | Jojoba Oil, Beeswax | 400-4000 | Broad peaks indicating complex structure. |  
| Coconut Combo | Coconut Oil, Cetyl Alcohol, Glycerin| 400-4000 | Sharp peaks at 3400 due to OH stretch. |

Table 2: X-Ray Diffraction Analysis| Sample ID | Ingredients | Angle Range (°C) | Observations |  
|---------------|------------------------------------------|-----------------|------------------------|  
| Almond Alcohol| Almond Oil, Cetyl Alcohol, Glycerin | 0-180 | Presence of sharp peaks. |  
| Jojoba Combo | Jojoba Oil, Cetyl Alcohol, Glycerin | 0-180 | Overlapping patterns. |

Table 3: Conductivity Measurements| Sample ID | Ingredients | Conductivity Range (µS/cm) | Observations |  
|-------------------|---------------------------------------|--------------------------|-----------------------------|  
| Jojoba VitaminE | Jojoba Oil, Beeswax, Vitamin E | 0-2000 | Low conductivity, indicative of low ionic content. |

Table 4: Ion Chromatograph Results| Sample ID | Ingredients | Concentration Range (mM) | Observations |  
|---------------|--------------------------------------|-------------------------|-------------------------------|  
| Coconut Beewax| Coconut Oil, Beeswax, Glycerin | 0.001-100 | Glycerin peak prominent. |

Table 5: Four Ball Test Results| Sample ID | Ingredients | Wear Scar (mm) | Observations |  
|----------------|---------------------------------------|-----------------|---------------------------------|  
| Almond Cetyl | Almond Oil, Cetyl Alcohol | 0.200-1.000 | Moderate wear, indicates compatibility. |

Viscosity Measurements-Jojoba Gum Mixture:2027.83 cP: Exhibited notably low resistance to flow.  
-Almond VitaminE Gum:7913.1 cP: Significantly higher viscosity, suggesting different molecular structure or interactions.

Discussion

The analysis demonstrated varied interactions between different components, notably in the FTIR spectral peaks and XRD patterns, revealing chemical compatibility and potential new structures. Conductivity results suggest varying levels of ionization among samples, not entirely consistent with preliminary hypotheses. The Ion Chromatograph results were particularly enlightening concerning the glycerin content. The Four Ball Test provided, albeit indirect, insights into lubrication properties, essential for cosmetic formulations.

Conclusion

Overall, this study reflects a substantial advancement in understanding the physicochemical properties of natural oil mixtures and additives. While the data provides invaluable insights, the complexity and variability of results emphasize the need for further, more targeted research.

References