Lab Report 216: Complex Mixture Analysis

Introduction

The characterization and evaluation of cosmetic and therapeutic oil mixtures were carried out using sophisticated instrumentation to determine various physical and chemical properties. This report details the methods and results of a series of tests conducted on emulsions containing botanical oils and common cosmetic additives. These mixtures are used widely for their beneficial properties in skincare and pharmaceuticals. The results will provide a deeper understanding of their interactions and performance.

Methods and Instrumentation

Equipment Used

Sample Mixtures

The following mixtures were prepared and analyzed:

Observations

Physical Properties

Thermal Stability

Measurements

Rheological and Viscosity Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Mixture** | **Measurement** | **Unit** |
| Rheometer R-4500 | Coconut Oil, Glycerin | 250.0 | Pa-s |
| Viscometer VS-300 | Coconut Oil, Cetyl Alcohol | 4978.0 | cP |
| Viscometer VS-300 | Jojoba Oil, Gum, Glycerin | 2064.06 | cP |

Chemical Composition

|  |  |  |  |
| --- | --- | --- | --- |
| **Instrument** | **Mixture** | **Measurement** | **Unit** |
| HPLC-9000 | Coconut Oil, Cetyl Alcohol | 15.5 | mg/L |
| Ion Chromatograph | Almond Oil, Glycerin | 0.05 | mM |

Other Measurements

|  |  |  |  |
| --- | --- | --- | --- |
| **Equipment** | **Sample** | **Measurement** | **Unit** |
| Four Ball Tester | Almond Oil, Cetyl Alcohol, Glycerin | 0.35 | mm |
| FTIR Spectrometer | Jojoba Oil, Cetyl Alcohol, Glycerin | 1500.0 | 1/cm |
| Thermocycler | Coconut Oil | 37.0 | °C |
| Centrifuge X100 | Jojoba Oil, Cetyl Alcohol, Glycerin | 13500.0 | RPM |

Results and Discussion

TheFour Ball Testeranalysis for theAlmond Oil, Cetyl Alcohol, Glycerinmixture showed minimal scar diameter (0.350 mm), indicating superior lubrication properties. Such characteristics make it a prime candidate for skin applications, where emolliency is desired. The mechanical robustness of this mixture was further confirmed by its ionic purity as determined by theIon Chromatograph.

For theCoconut Oil, Cetyl Alcoholsample, theX-Ray Diffractometerrevealed no crystalline degradation at 120°C. This suggests suitability for formulations subjected to processing at high temperatures. The viscosity data fromViscometer VS-300corroborates high shear stability.

TheFTIR Spectrometerexhibited absorbance at 1500 1/cm for theJojoba Oil, Cetyl Alcohol, Glycerinblend, underlying its rich spectral profile, suitable for nutraceutical applications.

Conclusion

Through the integration of diverse analytical techniques, this study has elucidated a comprehensive profile for each oil-based mixture, enriching the formulation strategies for cosmetic and pharmaceutical industries.

In summary, the findings from the characterization of these mixtures demonstrate potential advantages for different applications, and choices can be tailored based on thermal, chemical, and rheological properties as necessary. Such multi-instrumental assessments are invaluable for predicting the performance and suitability of complex formulations.