Laboratory Report 1170

Introduction

The purpose of this report is to examine various ingredient samples subjected to different testing instruments. Each combination of materials was treated as a distinct test sample. We delved into their rheological, spectroscopic, chromatographic, and other physical properties. These tests were conducted to assess the compatibility and behavior of ingredients used frequently in the cosmetic industry.

Table 1: Instrumentation and Measurements Overview

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| **Instrument** | **Sample Ingredients** | **Measurement** | **Values** | **Units** |
| Rheometer R-4500 | Coconut Oil, Cetyl Alcohol, Glycerin | Viscosity | 150.0 | Pa-s |
| FTIR Spectrometer FTIR-8400 | Jojoba Oil, Cetyl Alcohol | Wavenumber | 3400.0 | 1/cm |
| PCR Machine PCR-96 | Coconut Oil, Vitamin E | Cycle Threshold | 25.0 | Ct |
| X-Ray Diffractometer XRD-6000 | Almond Oil, Glycerin | Crystallinity | 75.0 | C |
| Four Ball FB-1000 | Coconut Oil, Beeswax, Glycerin | Wear Scar Diameter | 0.5 | mm |
| Mass Spectrometer MS-20 | Jojoba Oil, Gum | Mass-to-Charge Ratio | 1150.0 | m/z |
| UV-Vis Spectrophotometer UV-2600 | Jojoba Oil, Cetyl Alcohol, Glycerin | Absorbance | 1.5 | Abs |
| Ion Chromatograph IC-2100 | Coconut Oil, Cetyl Alcohol, Vitamin E | Concentration | 50.0 | mM |
| Rheometer R-4500 | Jojoba Oil, Glycerin | Viscosity | 500.0 | Pa-s |
| Viscometer VS-300 | Coconut Oil, Vitamin E | Viscosity | 5026.81 | cP |
| Viscometer VS-300 | Coconut Oil, Cetyl Alcohol | Viscosity | 5025.98 | cP |

Observations and Analysis

Rheological and Viscometric Studies

The rheological behavior of various oil and alcohol combinations provided insights into their flow characteristics when mixed. The rheometer R-4500 indicated a viscosity of 150 Pa-s for the Coconut Oil and Cetyl Alcohol mixture, establishing a baseline for comparison with other samples. Further studies with Jojoba Oil mixtures revealed a higher viscosity of 500 Pa-s, suggesting potential interactions or molecular configurations that contribute to resistance against flow.

Table 2: Rheometer and Viscometer Data Diversification

FTIR Spectroscopy Insights

Using the FTIR Spectrometer FTIR-8400, the functional groups of the Jojoba Oil and Cetyl Alcohol mixture were recorded at a characteristic peak of 3400 1/cm, pointing towards the hydroxyl group's vibrational modes. This measurement is essential for elucidating the interactions at the molecular level, confirming the presence of alcohols.

Spectroscopic and Chromatographic Observations

UV-Vis Absorbance:Jojoba Oil, Cetyl Alcohol, and Glycerin displayed an absorbance of 1.5 Abs, which may indicate pigment concentration or conjugated systems present in the sample.

Ion Chromatography:Notably, the mixture of Coconut Oil, Cetyl Alcohol, and Vitamin E yielded a concentration of 50 mM. Such findings suggest a moderate ionic presence, relevant for formulations requiring a balanced electrolyte content.

Other Analytical Techniques

X-Ray Diffraction Analysis:The crystalline properties of Almond Oil and Glycerin were assessed using an XRD-6000, rendering a crystallinity index of 75 C. This indicates a semi-crystalline structure, which could be beneficial in providing stability and texture to emulsions.

Wear Testing via Four Ball Tester:For lubrication assessments, the Coconut Oil and Beeswax mixture exhibited a 0.500 mm wear scar diameter, signifying potential suitability as a low-friction agent.

Additional Study Observations

Mass Spectrometry:A unique m/z ratio of 1150 was detected in the Mass Spectrometer MS-20 for Jojoba Oil and Gum, which requires further exploration to identify the associated molecular ions.

Conclusion

This investigative study underscores significant interaction behaviors among various oil-based mixtures tested using advanced instrumentation. While rheological properties varied considerably, spectroscopic analyses provided deeper insights into molecular interactions and composition.

The instrumentation factors, although sporadically varying in precision, collectively contributed a comprehensive picture of the formulation properties. Further studies employing a broader range of condition variations and additional mixing techniques may yield more refined data classification.

Random Note: Speculative measurements on unrelated ingredients such as Coconut Water and Avocado Oil yielded unrecorded data due to their presence being tangential to cosmetics and personal care applications.