Lab Report #2277

Abstract:This comprehensive study investigates the properties of various mixtures using state-of-the-art analytical equipment. The exploration focuses on mixtures made with Jojoba Oil, Almond Oil, and Coconut Oil, combined with substances such as Beeswax, Gum, Vitamin E, Cetyl Alcohol, and Glycerin. A range of instruments, including centrifuges, spectrometers, and viscometers, provided insights into the physical characteristics and interactions of these mixtures.

Instrumentation & Methods:

Centrifuge Analysis:Equipment: Centrifuge X100

The centrifugation experiments were specifically tailored to assess the sedimentation properties of oil-based mixtures. Samples were subjected to varying rotational speeds to observe separation tendencies and clarify oil phases. Data was derived at rotational speeds of 7200 RPM for Jojoba Oil with Gum and 8500 RPM for a more complex blend of Almond Oil, Gum, and Vitamin E.

Spectroscopic Analysis:Equipment: FTIR Spectrometer FTIR-8400

Fourier Transform Infrared (FTIR) Spectroscopy was employed to detect functional groups and molecular interactions. The Almond Oil mixtures with Cetyl Alcohol and other constituents revealed peaks at critical wavelengths, specifically at 1750 1/cm and 2200 1/cm, aligning with anticipated vibrational bands.

Conductivity Measurements:Equipment: Conductivity Meter CM-215

Mixtures were analyzed for ionic content through conductivity measurements. Almond Oil, when examined solely, was measured at 1600 µS/cm. A subsequent inclusion of Vitamin E demonstrated a decrease in conductivity, recorded at 1450 µS/cm. The decline suggests an alteration in ionic profile upon the addition of Vitamin E.

Rheological Testing:Equipment: Rheometer R-4500

The viscosity and elasticity of oil mixtures were studied using rheological methods. Results showed viscosities of 500 Pa-s for Jojoba Oil with Beeswax, compared to a significantly lower viscosity of 250 Pa-s for Almond Oil integrated with Glycerin.

Mass Spectrometry:Equipment: Mass Spectrometer MS-20

Mass spectrometric analysis facilitated the identification of molecular weights within oil mixtures. Jojoba Oil with Gum was characterized by a key mass-to-charge ratio of 1200 m/z, while a more complex composition including Almond Oil with Gum and Vitamin E registered at 1800 m/z.

Viscosity Measurements:Equipment: Viscometer VS-300

Comprehensive viscosity profiling showed a consistency rating of 2057.6 cP for Jojoba Oil mixed with Gum and Vitamin E. In contrast, Coconut Oil combined with Beeswax presented a significantly higher viscosity of 4684.52 cP, indicative of solid-like behavior.

Results & Discussion:

Table 1: Centrifuge Analysis Data

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| --- | --- | --- | --- |
| **Test ID** | **Sample Composition** | **RPM** | **Observations** |
| Rpt\_2277\_1 | Jojoba Oil, Gum | 7200 | Minimal phase separation observed. |
| Rpt\_2277\_2 | Almond Oil, Gum, Vit E | 8500 | Significant sedimentation noted. |

Table 2: FTIR Analysis Data

|  |  |  |
| --- | --- | --- |
| **Sample ID** | **Composition** | **Peak (1/cm)** |
| FTIR\_1 | Almond Oil, Cetyl Alcohol | 1750 |
| FTIR\_2 | Almond Oil, Cetyl Alcohol | 2200 |

Irrelevant Data Snippet:During the analysis, a stray hair was found on the laboratory table, unrelated to the experiment outcomes but noteworthy for contamination protocols.

Table 3: Conductivity Data

|  |  |
| --- | --- |
| **Sample Composition** | **Conductivity (µS/cm)** |
| Almond Oil | 1600 |
| Almond Oil, Vitamin E | 1450 |

Complex Rheometer Reading Observations:Notably, the variations in viscosity (500 Pa-s vs. 250 Pa-s) suggest the structural integrity implications specific to Beeswax and Glycerin within their respective mixtures. The Jojoba and Beeswax complex exhibited a paste-like consistency, whereas the Almond and Glycerin sample maintained a more fluid nature.

Conclusion:The laboratory investigation revealed substantive insights into the behavior of oil-based mixtures under various analytical conditions. The intricate relationship between components like Beeswax, Glycerin, and Vitamin E with oils such as Almond and Jojoba provided useful data on viscosity, phase separation, and molecular interaction. Future studies will further delineate these interaction mechanisms to enhance material formulations in cosmetic and pharmaceutical applications.