Lab Report 1953

Introduction:

In this analysis, a variety of mixtures focusing on oils and active components such as Vitamin E, Cetyl Alcohol, Glycerin, and Gum were studied using advanced instrumentation. The goal was to elucidate the spectral, chemical, and physical properties of these samples across several parameters.

Materials and Methods:

Instruments Used:

Evaluated the absorbance of mixtures.

FTIR Spectrometer FTIR-8400:

Analyzed functional groups present through IR spectra.

Thermocycler TC-5000:

Maintained precise temperature conditions for reactions.

NMR Spectrometer NMR-500:

Provided insights into the molecular structure by NMR analysis.

HPLC System HPLC-9000:

Quantified components in mixtures accurately.

Liquid Chromatograph LC-400:

Separated mixture components for concentration analysis.

Viscometer VS-300:

Observations and Data:

Table 1: UV-Vis and FTIR Measurements

|  |  |  |  |
| --- | --- | --- | --- |
| **Mixture Components** | **Instrument** | **Measurement/Reading** | **Unit** |
| Almond Oil, Vitamin E | UV-Vis Spectrophotometer UV-2600 | 2.5 | Abs |
| Almond Oil, Cetyl Alcohol, Glycerin | FTIR Spectrometer FTIR-8400 | 1450.0 | 1/cm |
| Jojoba Oil, Gum | UV-Vis Spectrophotometer UV-2600 | 3.0 | Abs |

Table 2: Thermal and Structural Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Mixture Components** | **Instrument** | **Measurement/Reading** | **Unit** |
| Jojoba Oil, Glycerin | Thermocycler TC-5000 | 37 | °C |
| Jojoba Oil, Vitamin E | NMR Spectrometer NMR-500 | 5 | ppm |

Table 3: Chromatographic and Viscosity Measurements

|  |  |  |  |
| --- | --- | --- | --- |
| **Mixture Components** | **Instrument** | **Concentration** | **Unit** |
| Jojoba Oil, Cetyl Alcohol, Vitamin E | HPLC System HPLC-9000 | 120.0 | mg/L |
| Jojoba Oil, Cetyl Alcohol, Glycerin | Liquid Chromatograph LC-400 | 350.0 | µg/mL |
| Coconut Oil, Gum | Viscometer VS-300 | 5209.12 | cP |
| Coconut Oil, Gum, Vitamin E | Viscometer VS-300 | 5219.32 | cP |

Results and Discussions:

Spectroscopic Analysis:The UV-Vis Spectrophotometer readings suggest differential absorbance peaks indicating varying concentrations of Vitamin E and Gum within a set mixture. A notable absorbance at 2.5 Abs for Almond Oil amalgamated with Vitamin E suggests strong electron transitions associated with antioxidant components.

Infrared Spectroscopy:The FTIR readings at 1450 1/cm denote characteristic alkyl chain vibrations, suggesting interactions between Cetyl Alcohol and Glycerin within Almond Oil. Such interactions may influence the product's emollient properties.

Thermal and Nuclear Magnetic Resonance (NMR) Analysis:The thermocycler confirmed stability of Jojoba Oil mixtures with Glycerin at 37°C, a critical temperature for consistent topical formulations. Correspondingly, the NMR peak at 5 ppm in Jojoba Oil with Vitamin E indicates specific hydrogen environments correlating to unsaturated regions enhanced by Vitamin E.

Chromatography and Rheology:The HPLC and LC analysis evidenced diverse concentration levels among the mixtures. Specifically, Jojoba Oil containing Cetyl Alcohol and Vitamin E showed a concentration of 120 mg/L, suggesting ample solubility and potential bioavailability of the active components. Additionally, the viscosity measurements for Coconut Oil with Gum and Vitamin E reflected minimal variations (~10 cP difference), indicating a negligible impact by Vitamin E on the mixture's viscosity.

Conclusion:

The report intricately captures the unique properties of oil-based mixtures, revealing invaluable insights into their physicochemical characteristics. This data serves as an essential guide for formulation development in cosmetic and pharmaceutical applications. Notably, the integrative approach across multiple analytical techniques ensured comprehensive profiling of each test sample, affirming the reliability of the study’s outcomes. Understanding these aspects will facilitate optimized formulation processes to enhance product effectiveness and consumer satisfaction.