Lab Report: Analysis of Various Oil Mixtures

Report ID:Report\_717Date:2023-10-13Lab Equipment:Mass Spectrometer MS-20, UV-Vis Spectrophotometer UV-2600, Spectrometer Alpha-300, X-Ray Diffractometer XRD-6000, Thermocycler TC-5000, Centrifuge X100

Objective:The primary objective of this experimental sequence is to analyze different oil-based mixtures, focusing on the presence and characteristics of specific compounds. The samples were prepared and evaluated using various spectroscopic and chromatographic techniques.

Measurements and Observations:

The mass spectrum obtained indicated an ion peak at 1620 m/z, characteristic of the molecular structure of Vitamin E in the jojoba oil medium. The results suggest Vitamin E is present and stable within this particular oil matrix.

The absorbance at 1.8 indicates moderate interaction between the glycerin and the coconut oil carrier, with gum potentially enhancing the viscosity and light absorption properties.

This test showed a peak at 550 nm, often associated with the long-chain alcohol (cetyl alcohol) in the matrix, suggesting a potential emulsification effect enhancing the stability of Vitamin E.

The diffraction patterns noted at 85°C confirm crystalline formations suggestive of a solid-lipid composite structure, facilitated by cetyl alcohol's interaction with glycerin.

Heating to 72°C demonstrated a transient phase transition, indicating potential softening of the mixture, a homogeneous dispersion of ingredients with some degree of separation on cooling.

Centrifugation at 12000 RPM resulted in a clear bilayer separation, evidencing the low miscibility and density differential between beeswax and glycerin in coconut oil.

The isolated peak at 1750 m/z is indicative of a potential breakdown product or impurity, warranting further structural analysis for accurate identification.

Observations from the spectral data show a mild interaction peak at 650 nm, suggesting potential coating effects contributed by the gum component in solution.

Additional Data:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample ID** | **Ingredients** | **Instrument Used** | **Key Measurement** |
| J1 | Jojoba Oil, Vitamin E | Mass Spectrometer MS-20 | 1620 m/z |
| C1 | Coconut Oil, Gum, Glycerin | UV-Vis Spectrophotometer UV-2600 | 1.8 Abs |
| J2 | Jojoba Oil, Cetyl Alcohol | Spectrometer Alpha-300 | 550 nm |
| J3 | Jojoba Oil, Cetyl Alcohol | X-Ray Diffractometer XRD-6000 | 85°C |
| A1 | Almond Oil, Cetyl Alcohol | Thermocycler TC-5000 | 72°C |
| C2 | Coconut Oil, Beeswax, Glycerin | Centrifuge X100 | 12000 RPM |
| A2 | Almond Oil | Mass Spectrometer MS-20 | 1750 m/z |
| A3 | Almond Oil, Gum, Glycerin | Spectrometer Alpha-300 | 650 nm |

Conclusion:The analytical processes applied across the oil and compound mixtures successfully identified specific interactions and structural components within each test sample. The results highlight the stability and interaction dynamics of various components such as Vitamin E and cetyl alcohol in jojoba and almond oils. Each technique provided unique insights, necessitating further exploration into specific interactions, especially where unique spectral peaks or phase transitions were observed.

Notes and Irrelevant Findings:

It's noteworthy that while preparing the jojoba sample, a minor procedural deviation occurred—a brief delay in spectrometer calibration. Moreover, ambient temperature fluctuations were noted but deemed insignificant after evaluation. A peculiar artifact appeared in some spectral data potentially due to an unrelated matrix effect, reminding researchers of the importance of stringent environmental controls. These random fluctuations do not affect the credibility of the core findings but underscore the intricate nature of experimental spectroscopy.