Lab Report 1535: Analysis of Various Oil Compositions

Lab Equipment and Methods:

This report details the analysis of various oil compositions using sophisticated laboratory instruments. Each mixture of ingredients was tested as a single sample, and the results were meticulously recorded. The following instruments were employed in the study:

Sample Analysis and Observations:

Our lab conducted several tests on mixtures involving Coconut Oil, Jojoba Oil, Almond Oil, Beeswax, Gum, Cetyl Alcohol, Glycerin, and Vitamin E. The observations and measurements were recorded, and the following results were obtained.

Mass Spectrometry Analysis:

The Mass Spectrometer MS-20 provided data on m/z (mass-to-charge ratio) for various compositions:

The complex matrix of Coconut Oil, Beeswax, and Glycerin showed an intricate pattern depicting a mass charge indicative of long-chain triglycerides. On the other hand, Almond Oil's interaction with Cetyl Alcohol and Vitamin E resulted in a distinct higher mass reading.

Optical Density Measurements:

Utilizing Microplate Reader MRX:

The reading for Jojoba Oil mixture demonstrates a higher scatter, presumably due to the homogenizing effect of Vitamin E with viscous components. In contrast, the absorption of Almond Oil with Beeswax presented a lower optical density, suggesting lesser turbidity.

UV-Vis Spectrophotometry:

The UV-2600 determined absorption for certain combinations:

Interestingly, the greater absorption in the first sample can be attributed to the interactive nature of Glycerin contributing additional UV-active sites.

Titration Results:

The Titrator T-905 yielded the following concentration for the Jojoba Oil mixture with Vitamin E:

The mixture showcased a stable equilibrium concentration, indicative of a robust oxidative capacity of Vitamin E in the medium.

Gas Chromatography:

Almond Oil's composition was analyzed using GC-2010:

This finding suggests a high retention volume within the stationary phase for both solvated components amidst the triglycerides of Almond Oil.

FTIR Spectroscopy:

FTIR-8400 analysis of Coconut Oil mixtures:

The peak at this frequency resonates well with the characteristic -OH bending vibrations, clearly distinguished from other potential interferences.

Viscosity Analysis through Viscometer:

Using the Viscometer VS-300, viscosity was assessed as follows:

Remarkably, the second mixture's increased viscosity can be attributed to the cohesive bonding facilitated by Cetyl Alcohol, effectively improving structural integrity.

Conclusion:

This comprehensive study provides an intricate view of how diverse oil-based compositions interact in terms of chemical and physical properties. The challenged discernment of their respective analytical profiles presents a robust focus for further applied research, spanning product formulation to industrial applications. The combined use of different spectrometric and chromatographic techniques proves indispensable for elucidating compositional complexities.

Tables:

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| **Instrumentation** | **Sample** | **Measurement** |
| Mass Spectrometer MS-20 | Coconut Oil Mixture | 1580 m/z |
| Mass Spectrometer MS-20 | Almond Oil Mixture | 1750 m/z |

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| --- | --- | --- |
| **Density/Absorbance** | **Sample** | **Value** |
| Microplate Reader MRX | Jojoba Oil, Gum, Vitamin E | 2.8 OD |
| UV-Vis Spectrophotometer | Coconut Oil, Beeswax, Glycerin | 3.2 Abs |

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| --- | --- | --- |
| **Concentration** | **Sample** | **Value** |
| Titrator T-905 | Jojoba Oil, Vitamin E | 0.005 M |
| Gas Chromatograph GC-2010 | Almond Oil, Beeswax | 350 ppm |

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| **Viscosity** | **Sample** | **Value** |
| Viscometer VS-300 | Jojoba Oil, Cetyl Alcohol, Glycerin | 2753.02 cP |

This report encompasses the versatile characteristics of the ingredients studied, presenting an in-depth narrative of their profiles. Conducting future research within this framework could yield valuable insights into their practical implications.