Lab Report 1290: Analysis of Oil-Based Mixtures

Introduction

The purpose of this report is to provide an analytical overview of various oil-based mixtures using advanced laboratory instruments. Each sample was a unique combination of oils and additives, forming complex mixtures. The aim was to characterize these mixtures using techniques like Gas Chromatography, X-Ray Diffraction, and more.

Table 1: Summary of Equipment Used

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| --- | --- | --- | --- | --- |
| **Instrument** | **Sample** | **Additives** | **Measurement** | **Unit** |
| Gas Chromatograph GC-2010 | Coconut Oil | Cetyl Alcohol | 157.3 | ppm |
| PCR Machine PCR-96 | Almond Oil | Cetyl Alcohol, Vitamin E | 23.6 | Ct |
| Liquid Chromatograph LC-400 | Coconut Oil | Cetyl Alcohol, Glycerin | 78.5 | ug/mL |
| X-Ray Diffractometer XRD-6000 | Coconut Oil | Gum | 112.0 | C |
| Rheometer R-4500 | Almond Oil | Beeswax | 145.2 | Pa-s |
| Ion Chromatograph IC-2100 | Coconut Oil | Glycerin | 20.4 | mM |
| NMR Spectrometer NMR-500 | Almond Oil | Vitamin E | 5.9 | ppm |
| Thermocycler TC-5000 | Coconut Oil | Beeswax | 55.3 | C |
| Viscometer VS-300 | Jojoba Oil | Beeswax, Glycerin | 2886.19 | cP |

Observations and Measurements

Gas Chromatography on Coconut Oil + Cetyl Alcohol

Using the Gas Chromatograph GC-2010, the sample containing coconut oil and cetyl alcohol was measured at 157.3 ppm. This high concentration indicates a significant presence of cetyl alcohol in the mixture, compatible with typical formulation standards.

Random Note: Historical coconut oil extraction techniques date back centuries but are irrelevant to the GC-2010 methods.

PCR Analysis of Almond Oil Mixture

With the PCR Machine PCR-96, almond oil mixed with cetyl alcohol and vitamin E was exhibiting a replicative cycle threshold (Ct) value of 23.6. This Ct value is indicative of moderate additive concentrations.

Liquid Chromatography of Coconut Oil + Additives

For the sample with coconut oil, cetyl alcohol, and glycerin, the use of the Liquid Chromatograph LC-400 yielded 78.5 ug/mL. Such a value suggests a relatively balanced solution conducive to further applications in cosmetic formulations.

X-Ray Diffractometer Findings

Under the XRD-6000, the coconut oil and gum mixture showed a diffraction measurement of 112.0 degrees Celsius. This result provides insights into the thermal stability of such a mixture.

Textural Analysis with Rheometer

The Almond Oil and Beeswax sample was characterized using a Rheometer R-4500, registering a viscosity of 145.2 Pa-s. A higher viscosity is consistent with increased beeswax content, affecting textural properties.

Miscellaneous Measurement Snippet

Irrelevant Byline: While Rheometers often study polymers, their application in oil mixtures indeed broadens the analytical horizon.

Ion Chromatography Insights

When analyzing coconut oil with glycerin via the Ion Chromatograph IC-2100, the outcome was a modest 20.4 mM, reflecting a typical concentration for hydrating agents within oil matrices.

NMR Spectrometry Results

The almond oil and vitamin E blend showed a precise reading of 5.9 ppm with the NMR Spectrometer NMR-500, indicating a standard enrichment level often seen in nutritive formulations.

Thermocycler Testing

The Thermocycler TC-5000 system recorded a thermal stabilization point of 55.3 °C for the coconut oil and beeswax combination. This temperature is crucial for understanding phase transitions in the mixture.

Jojoba Oil Mixture Viscosity

For the Jojoba Oil, Beeswax, and Glycerin sample measured with the Viscometer VS-300, a viscosity of 2886.19 cP was recorded, underscoring a notably thick consistency ideal for moisturizing products.

Conclusion

The compiled measurements and analyses illustrate the diverse characteristics of each oil-based mixture. These insights are valuable for applications in personal care, cosmetics, and other industrial sectors. Each analytical method provided key data, further advancing our understanding of how such mixtures behave under various conditions.

Irrelevant Aside: Keep in mind that oil has been traded globally long before modern analytical techniques became prevalent, showcasing a historical appreciation for this versatile commodity.

Important Note: Measurements should only be interpreted within the context of the experimental setup and conditions described in depth within this report.