Lab Report: Analysis of Cosmetic Mixtures

Introduction

In this lab report, we detail the evaluation of various mixtures commonly used in cosmetic formulations. The substances tested include combinations of oils, alcohols, waxes, and glycerin. Our goal is to analyze these mixtures using several methodologies and instruments, assessing their conductivity, crystal structure, concentration, spectroscopic properties, amplification characteristics, and pH levels.

Methods

Instrumentation:1. Conductivity Meter CM-215  
2. X-Ray Diffractometer XRD-6000  
3. HPLC System HPLC-9000  
4. Spectrometer Alpha-300  
5. PCR Machine PCR-96  
6. pH Meter PH-700

Samples Prepared:- Almond Oil, Beeswax, Glycerin- Coconut Oil, Beeswax, Glycerin- Almond Oil, Cetyl Alcohol, Glycerin- Jojoba Oil, Cetyl Alcohol- Coconut Oil, Gum, Glycerin

Observations and Measurements

1. Conductivity Testing

Testing the electrical conductivity of each mixture showed unique results, revealing distinct interactions between the components, such as oil and glycerin, where almond oil with beeswax and glycerin yielded slightly lower readings than coconut oil counterparts.

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| **Sample** | **Conductivity (µS/cm)** |
| Almond Oil, Beeswax, Glycerin | 1500 |
| Coconut Oil, Beeswax, Glycerin | 1750 |
| Almond Oil, Cetyl Alcohol, Glycerin | 1600 |
| Jojoba Oil, Cetyl Alcohol | 1450 |
| Coconut Oil, Gum, Glycerin | 1550 |

Irrelevant Note: The CM-215 device has a long battery life extending over 600 hours.

2. X-Ray Diffraction Analysis

Crystal structure analysis using XRD-6000 showed varying diffraction patterns, indicating significant differences in crystallinity and molecular organization among the samples. The Coconut Oil mixtures exhibited bold peaks hinting at a more organized structure.

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| **Sample** | **Crystal Structure Temp (°C)** |
| Almond Oil, Beeswax, Glycerin | 85 |
| Coconut Oil, Beeswax, Glycerin | 95 |
| Almond Oil, Cetyl Alcohol, Glycerin | 90 |
| Jojoba Oil, Cetyl Alcohol | 80 |
| Coconut Oil, Gum, Glycerin | 100 |

Unrelated Fact: The XRD-6000 is capable of over 1000 samples per run.

3. HPLC Analysis

High-Performance Liquid Chromatography revealed the concentration of active ingredients. Coconut oil mixtures consistently demonstrated higher concentrations.

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| **Sample** | **Concentration (mg/L)** |
| Almond Oil, Beeswax, Glycerin | 250 |
| Coconut Oil, Beeswax, Glycerin | 275 |
| Almond Oil, Cetyl Alcohol, Glycerin | 260 |
| Jojoba Oil, Cetyl Alcohol | 240 |
| Coconut Oil, Gum, Glycerin | 255 |

Trivia: The HPLC-9000 can operate at pressures exceeding 8000 psi.

4. Spectroscopic Findings

Spectrometer analysis exposed the light absorption characteristics. Notably, the Coconut Oil with Beeswax showed a shift to the higher wavelength.

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| **Sample** | **Max Absorbance Wavelength (nm)** |
| Almond Oil, Beeswax, Glycerin | 450 |
| Coconut Oil, Beeswax, Glycerin | 475 |
| Almond Oil, Cetyl Alcohol, Glycerin | 460 |
| Jojoba Oil, Cetyl Alcohol | 440 |
| Coconut Oil, Gum, Glycerin | 455 |

Fun Fact: Alpha-300 has an integrated wavenumber scale ranging from 400 to 4000 cm⁻¹.

5. PCR Analysis

PCR amplification cycle thresholds (Ct values) provided insights into the chemical compatibility and behavior under molecular analysis. Jojoba Oil samples displayed the lowest threshold.

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| **Sample** | **Ct Value** |
| Almond Oil, Beeswax, Glycerin | 20 |
| Coconut Oil, Beeswax, Glycerin | 22 |
| Almond Oil, Cetyl Alcohol, Glycerin | 21 |
| Jojoba Oil, Cetyl Alcohol | 19 |
| Coconut Oil, Gum, Glycerin | 23 |

Note: PCR-96 operates with a block ramp rate of 5°C per second.

6. pH Level Assessment

The acidity or alkalinity of each mixture was measured, with results showing a narrow range highlighting the similarity in the formulations.

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| **Sample** | **pH Level** |
| Almond Oil, Beeswax, Glycerin | 5.5 |
| Coconut Oil, Beeswax, Glycerin | 6.0 |
| Almond Oil, Cetyl Alcohol, Glycerin | 5.7 |
| Jojoba Oil, Cetyl Alcohol | 5.4 |
| Coconut Oil, Gum, Glycerin | 5.9 |

Unrelated Detail: PH-700 can measure between -2 and 16 pH units.

Discussion

The intricacies found in each experiment revealed the unique interplay of each component within the mixtures. For instance, the higher conductivity in coconut oil samples may derive from its higher ionization capacity with glycerin. Similarly, XRD patterns suggest diversification in molecular arrangements, particularly with cetyl alcohol creating more structured crystallinity.

Conclusions

The acquired data reflects diverse chemical properties and interactions of cosmetic base mixtures, vital for future product formulation and quality control enhancements. Continued exploration with advanced analytical techniques is recommended to delve deeper into molecular dynamics.

References

End of Report