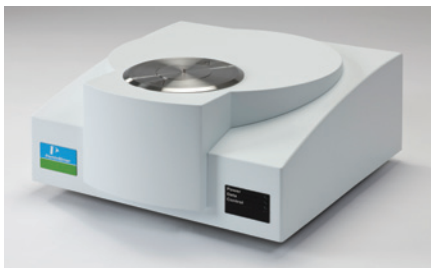
APPLICATION NOTE

Differential Scanning Calorimetry

# Thermal Analysis of Lipsticks Utilizing DSC



DSC 4000

## Introduction

Thermal analysis is very useful when applied to the development and analysis of cosmetics. Lipsticks are a complex mixture of compounds that are designed to spread easily and yet wear well. Often they are studied by Dynamic Mechanical Analysis, where the frequency response can be correlated with the spreading of the material. However, DSC is often used as a QC tool because it is faster to run than DMA. This application note describes DSC evaluation of lipstick qualities based on the melting of the fats and oils which are the main content of lipsticks.

## Methods

Using DSC to analyze lipstick involves a technique called fingerprinting. The peaks are not assigned to specific transitions but the overall shape, size, and temperature of the peaks are used as an indicator of performance. As lipstick is applied on the body and worn at room temperature, melting normally occurs slightly above room temperature.

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Lipstick samples were obtained from a customer with a range of properties. Samples were run on a single furnace, heat flux DSC under the conditions shown in Table 1.

| *Table 1.* **Experimental Conditions** | |
|---|---|
| Instrument | Jade DSC |
| Heating rate | 10 ˚C/minute |
| Sample Mass | 10 mg |
| Sample Pan | Hermetically sealed aluminum pans |
| Purge Gas | Nitrogen |
| Temperature Range | -100 to 100 |

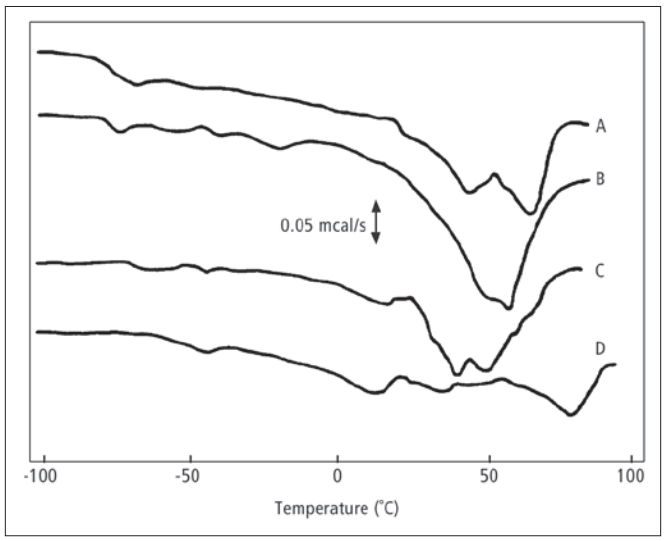


*Figure 1.* DSC Profiles of Lipsticks. Sample weight: 30 mg, heating rate: 2 ˚C/min.

## Experimental

Lipstick samples were obtained from a customer with a range of properties. Samples were run on a single furnace, heat flux DSC under the conditions shown in Table 1.

## Results

Figure 1 shows DSC profiles of four different kinds of lipsticks measured in hermetically sealed sample containers. Each product shows a different profile. The endothermic peaks shown for all of the samples are from the melting of the fats and oils in the lipsticks.

Looking at the 4 samples, one sees that three of them have significant melting peaks in the range of 25-50 ˚C. (In this example, end point down.) All of these will tend to spread on a warm surface to some degree. The last sample shows a higher melting peak, suggesting it will be stiffer to apply but stay harder on application.

This data can be interpreted as meaning that Lipstick B spreads well and that Lipstick D wears well.

## Summary

Fingerprinting, comparison, and trend analysis are all viable options for DSC in addition to the traditional approach of identifying specific transitions. This allows for more complex samples to be studied and has been used for food products in the past. Here, we see that application can be applied to personal care products.

DSC analysis can be used to determine the spreading qualities and wear qualities of lipsticks and other cosmetics.

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