**BROOKFIELD**

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## TEST PRINCIPLE

The objective was to compare the bending force of two brands of lipsticks; premium lipstick and budget lipstick.

## BACKGROUND

For users of lipsticks, there is a general preference for a product that does not bend, crumble, crack, or break during application. As such, base ingredients become of paramount importance in formulating a product with resilience and physical strength capable of withstanding firm lipstick application by the user.

The **cantilever test** is an imitative test using a hemispherical edged probe to simulate the bending action caused during application.
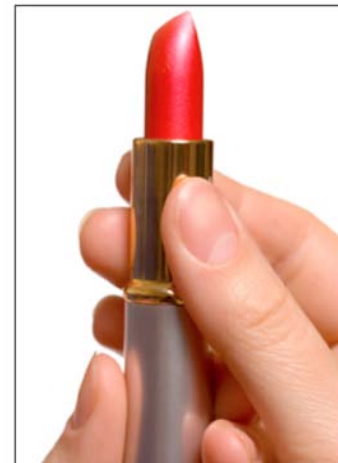
## METHOD

EQUIPMENT   CT3 with 4.5kg load cell
TA-LC Lipstick Cantilever Accessory
Texture Pro CT Software

SETTINGS

| | |
|---|---|
| Test Type: | Compression |
| Pre-Test Speed: | 1.0 mm/s |
| Test Speed: | 1.0 mm/s |
| Post-Test Speed: | 10.0 mm/s |
| Target Type: | Distance |
| Target Value: | 7 mm |
| Trigger Force: | 20 g |

Note:  It is recommended that the pre-test speed be the same as or less than the test speed for accurate trigger detection; for example, 1mm/s test speed will require ≤1mm/s pre-test speed.

## SAMPLE PREPARATION

Condition the sample for temperature before testing. In this test samples were conditioned at 21°C overnight.

## PROCEDURE

1. Secure the fixture base table to the base of the machine and fit the base plate of the cantilever onto the fixture base table.
2. Clamp the sample within the orifice of the supporting fixture.
3. Wind out the lipstick to its maximum length
4. Position the upper bending fixture such that it strikes the sample at approximately 3-4mm away from the tip. This will enable the sample to bend in response to the force applied by the lip shaped hemispherical probe emulating lipstick application to the lips.

## RESULTS

A typical TexturePro CT plot of the bending force on two different lipsticks:
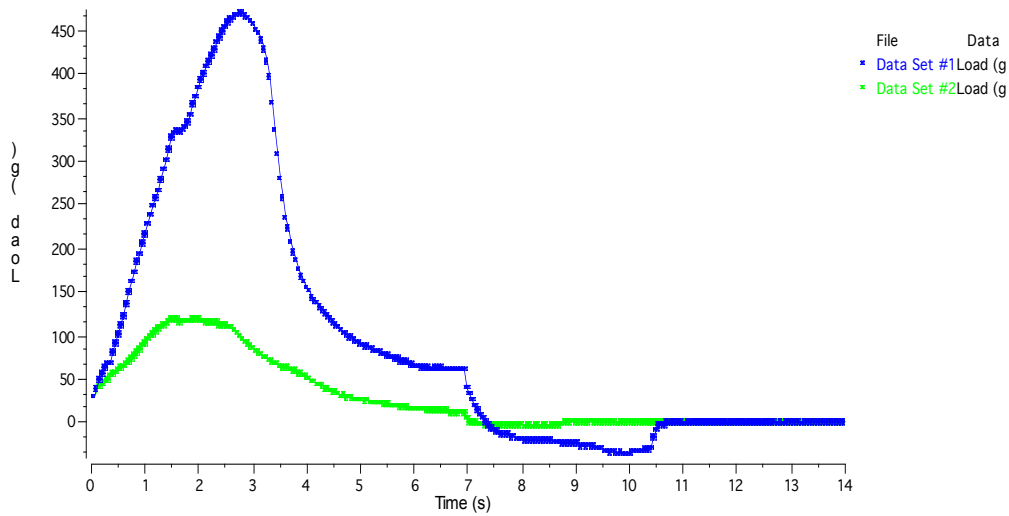


**Figure I**

The graph in Figure 1 shows the bending force of two different 4g lipsticks tested at 21$^o$C and 3mm from the tip of the lipstick.

Data Set # 1: Sample A (Premium Lipstick)
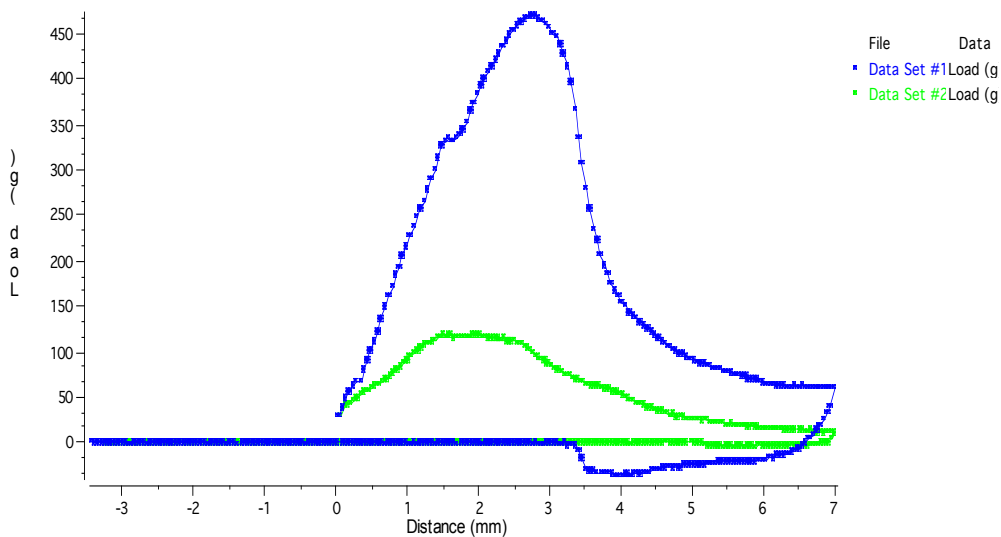Data Set # 2: Sample B (Budget Lipstick)



**Figure II**

The Figure 2 graph shows the load verses distance for the bending force of two different 4g lipsticks.

Data Set # 1: Sample A (Premium Lipstick)
Data Set # 2: Sample B (Budget Lipstick)

## OBSERVATIONS

When a trigger force of 20g is achieved, the probe begins to move down to a deformation distance of 7mm. During this time the sample is bent until it breaks away (in some cases).

Sample **hardness** can be obtained from the maximum force value on the graph and sample **stiffness** (apparent modulus) from the gradient of the slope during the bending action. The distance at which the break occurs (deformation at peak load) gives an indication of the **brittleness** of the sample. Typically, a brittle sample would posses a short bending distance. Energy required to bend the lipstick can be quantified by selecting (work done hardness1 in the software), this also gives a good indication of the consistency of the lipstick.

From the graph, Sample A (premium lipstick) is twice as hard as Sample B (budget lipstick). Sample B is also more brittle than Sample A breaking off within two seconds.

Test results from two lipstick samples give the following values:

Table I

| Sample | Hardness (g) | Deformation Hardness (mm) | Work Done (mJ) |
|---|---|---|---|
| Premium Lipstick | 469 | 2.75 | 13.97 |
| Budget Lipstick | 118 | 1.91 | 4.09 |