

Lipstick Hardness Analysis

Understanding the hardness of lipsticks is essential for product quality and performance. Proper hardness ensures durability, user comfort during application, and consistency across batches, preventing breakage or crumbling under normal usage conditions.

Test Principle:

- Measure the hardness of lipsticks by penetration with a 2 mm needle probe, as per ASTM D1321-10, to determine the force required to penetrate the lipstick to a defined distance of 5 mm.

Background:

- Lipsticks are composed mainly of waxes and oils, which determine product firmness, spreadability, and texture. Measuring hardness helps assess the suitability of different waxes for achieving desired properties and monitors consistency across various temperature conditions during transportation and storage.



Equipment:

- Instrument: CTX Texture Analyzer with 5 kg load cell
- Accessories: Round Base Table (TA-TR-KIT), Adjustable Vice Grips (TA-AVG), 2 mm Needle Probe (TA39)
- Software: Texture Pro

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 Value: 5 mm
- Trigger Force: 5 g

Procedure:

1. Attach the 2 mm needle probe to the load cell and clean the probe.
2. Place the round base table and loosely tighten screws.
3. Slide the adjustable vice grips onto the base table.
4. Wind the lipstick to its maximum length and secure it in the vice grips.
5. Align the sample centrally under the needle probe.
6. Start the penetration test.
7. Clean the needle between tests to remove any adhering wax.



Observations:

- At a trigger force of 5 g, the probe penetrates the sample to 5 mm.
- Figure I: Force vs. Time for two lipstick formulations tested at 20°C.
- Figure II: Force vs. Distance for penetration of two lipsticks.
- Sample A is harder (higher force required) than Sample B, indicating greater firmness. The area under the curve represents the work done to achieve penetration.

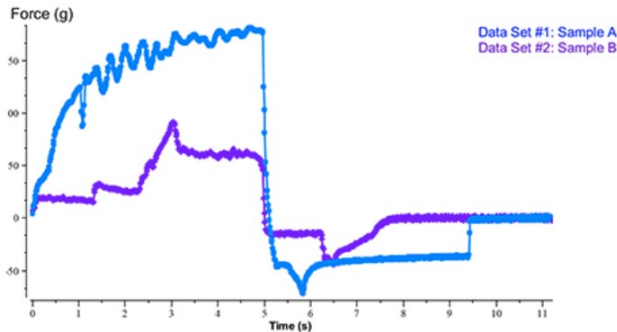


Figure I

Figure I shows force vs time for the penetration test on two lipsticks of different formulation tested at 20°C.

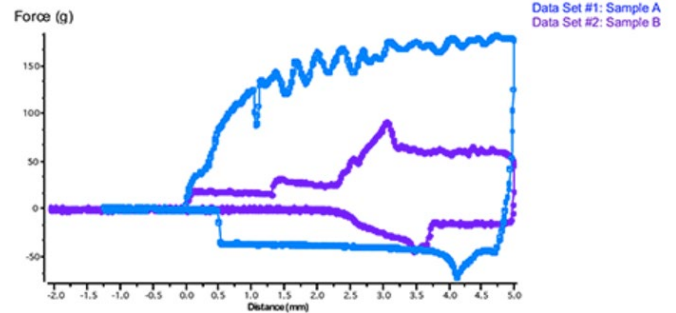


Figure II

Figure II shows force vs. distance for the penetration test on two lipsticks of different formulation.

Results:

- Table I: Hardness and Work Done Values:
- Sample A: Hardness = 181 g; Work Done = 6.92 mJ
- Sample B: Hardness = 91 g; Work Done = 2.11 mJ

Table I

Product	Hardness (g)	Work Done (mJ)
Sample A	181	6.92
Sample B	91	2.111

Conclusion:

The analysis confirms that Sample A is firmer than Sample B, demonstrating the effectiveness of the testing method for ensuring consistent lipstick hardness and performance. This method aids in optimizing formulations for durability and user comfort.