# High Temperature General Pasting Method

## Scope

- Ingredient suitability for high temperature processing
- Product development
- Process control
- Finished product and competitive product analysis

## Rapid Visco Analyser 4800 (RVA 4800)

The Rapid Visco Analyser (RVA) is a cooking viscometer with ramped temperature and variable shear capability optimized for testing viscous properties of starch and similar temperature-dependent hydrocolloids. The RVA 4800 can perform regular tests below 100°C, as well as high-temperature tests up to 140°C in a specially designed pressure vessel. The RVA 4800 can be used to assess the viscous potential and stability of starches, gums, dairy proteins and other ingredients under the high temperatures required for sterilization and/or rapid processing including ultra-high temperature (UHT) processing, batch pressure cooking, retorting, jet-cooking and extrusion.

## Description

The ability of the components of a product to withstand high-temperature processing conditions is of interest to formulators, who must balance the need for acceptable product rheology with safety and throughput. High-temperature processes are used in the manufacture of many food and industrial products. The viscosity and pasting behavior of starch during the manufacturing process are affected by its chemical make-up and modifications, including those of resistant starches (a source of dietary fiber) derived from retrograded high amylose types (RS3, Fig. 1B) or cross-linked starches (RS4).

This method is applicable to any liquid or hydrated ground material including, but not limited to, unmodified and modified starches, flours, whole meals, gums, diary ingredients and their formulations.
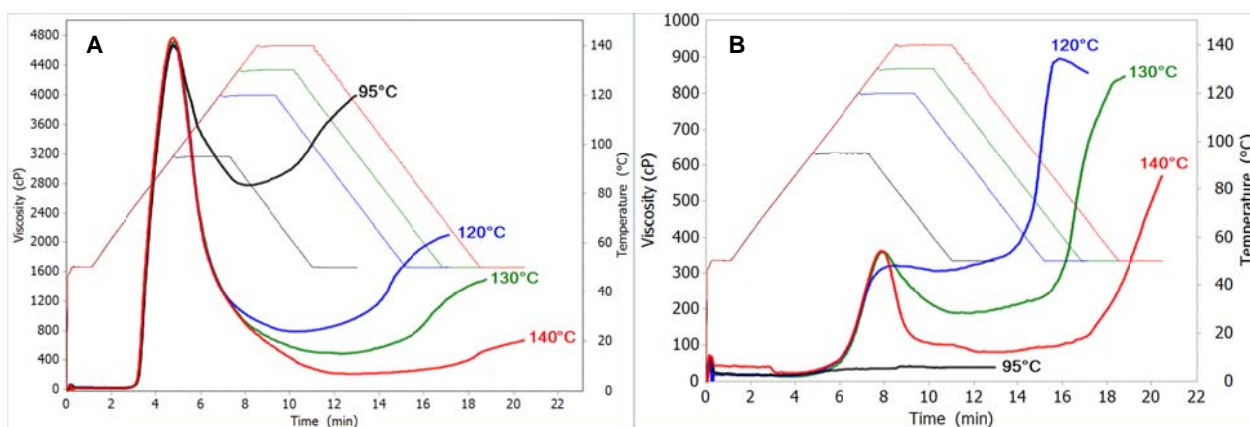


**Figure 1.** Pasting curves of wheat starch (A) and high-amylose corn starch (B) tested at various temperatures. Note the inability of the high-amylose corn starch to paste and gel below 100°C (black curve).

## Method

High-temperature pasting profile with selectable maximum temperature (120°C, 130°C or 140°C).

## Test requirements

**RVA mode:** High temperature coupling, lever forward
**Cans & paddles:** High temperature, tray of 42 (PN NS106944)

## Sample preparation:

X g sample at 14% moisture and 25.0 mL distilled water. The amount of sample to use depends on the material. The following table may be used as a general guide.

**Table 1.** Amount of sample for various materials.

| Material | Amount (g) |
|---|---|
| Whole meal | 4.00 |
| Flour | 3.50 |
| Native Starch: | |
|   Cereal, Non-Waxy | 3.00 |
|   Cereal, Waxy | 2.50 |
|   Potato | 2.00[1] |
|   Tapioca | 2.50 |
| Modified Starch: | |
|   Acid Modified | 4.00-22.00[2] |
|   Oxidized | 4.00-22.00[2] |
|   Substituted | 2.50 |
|   Cross-Linked | 2.50 |

[1]Use 1.20 g if the starch was not prepared commercially
[2]The amount to use depends on the degree of modification
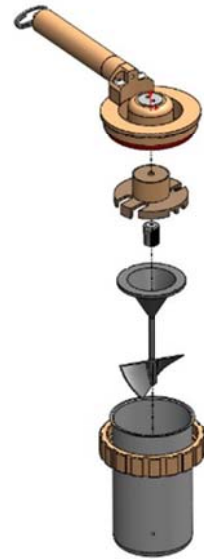
## Profile

**Table 2.** HT120 – HT pasting to 120°C.

| Time | Type | Value |
|---|---|---|
| 00:00:00 | Temperature | 50°C |
| 00:00:00 | Speed | 960 rpm |
| 00:00:10 | Speed | 160 rpm |
| 00:01:00 | Temperature | 50°C |
| 00:06:50 | Temperature | 120°C |
| 00:09:20 | Temperature | 120°C |
| 00:15:10 | Temperature | 50°C |
| 00:17:10 | End | |

**Table 3.** HT130 – HT pasting to 130°C.

| Time | Type | Value |
|---|---|---|
| 00:00:00 | Temperature | 50°C |
| 00:00:00 | Speed | 960 rpm |
| 00:00:10 | Speed | 160 rpm |
| 00:01:00 | Temperature | 50°C |
| 00:07:40 | Temperature | 130°C |
| 00:10:10 | Temperature | 130°C |
| 00:16:50 | Temperature | 50°C |
| 00:18:50 | End | |

**Table 4.** HT140 – HT pasting to 140°C.

| Time | Type | Value |
|---|---|---|
| 00:00:00 | Temperature | 50°C |
| 00:00:00 | Speed | 960 rpm |
| 00:00:10 | Speed | 160 rpm |
| 00:01:00 | Temperature | 50°C |
| 00:08:30 | Temperature | 140°C |
| 00:11:00 | Temperature | 140°C |
| 00:18:30 | Temperature | 50°C |
| 00:20:30 | End | |
| Idle Temperature: 50 ± 1°C | | |
| Time Between Readings: 4 s | | |

## Measure

PT: Pasting temperature (°C)
PV: Peak viscosity (cP)
PTi: Time to peak (min)
BD: Breakdown (cP)
TV: Trough/minimum viscosity (cP)
SB: Setback (cP)
FV: Final viscosity (cP)