

Application Note

Change in viscosity in degradation process of gelatinized starch

| | | |
|--------------------|---|--------------------------------------|
| Industry | : | Food & beverage, Pharmaceutical |
| Instrument | : | Viscometer |
| Measurement method | : | Electro Magnetically Spinning Method |
| Standards | : | |

1. Scope

Starch is a polysaccharide composed of two kinds of macromolecules, amylose and amylopectin, which are linked by glucose produced by photosynthesis by plants.

As a food industry, starch is used as a thickener, a water retention material, a texture improving and dispersing agent. And it is used in the pharmaceutical industry as an excipient for pharmaceutical tablets, as a fermentation medium raw material for antibiotics, and It is also used in various fields as an adhesive for industrial applications.

An example of measuring Change in viscosity in degradation process of gelatinized starch using an EMS viscometer that can be measured by sealing, sterilization and non-contact will be shown below.

2. Precautions

None.

3. Post-measurement procedure

The sample container and the sample are discarded appropriately.

4. Apparatus

- EMS Viscometer
- Control Laptop PC

5. Reagents

- Sample : Gelatinized 3%-Potato starch solution (1,000 mPa·s)
- 0.03 wt% α -amylase solution
- Ion exchanged water (diluent)

6. Procedure

- 1) Enter the following conditions in measurement condition of the sequence mode of control software.

| | |
|------------------------------------------|-------------------------------------------------------|
| ✧ Measurement mode | :Repeat mode |
| ✧ Measurement temperature | :25°C or 37°C |
| ✧ Motor rotation speed | :1,000 rpm |
| ✧ Measurement time | :I (1 second : The sample with enzyme) |
| ✧ | II(5 seconds : The sample without enzyme) |
| ✧ Repeat count | :100 times (measurement is interrupted when cured) |
| ✧ Measurement interval | :1 second |
| ✧ Waiting time for temperature stability | :5 minutes |
- 2) Place the spherical probe $\phi 4.7$ mm, potato starch 0.03 g and ion exchange water 1000 μL in the sample container, cover it with a cap and set in the instrument, heat it in advance at 55 ° C for 5 minutes as pretreatment.
- 3) After raising the temperature to 75 ° C at 2 ° C per minute, warm it at 75 ° C for 5 minutes to prepare a gelatinized 3% potato starch solution (gelatinized starch sample).
- 4) Remove the gelatinized starch sample from the instrument and cool the gelatinized starch sample at room temperature.
- 5) Add 10 μL of 0.03 wt% α -amylase(with amylase) or ion-exchanged water(without amylase) to the gelatinized starch sample, immediately place it in the instrument and press the measurement button.
- 6) Measure another samples on the same condition after the measurement of the first sample is completed.

7. Example

By added α -amylase, it was confirmed that the viscosity decreased due to degradation of potato starch and that the degradation speed of the potato starch by the enzyme was faster at 37 ° C. (higher enzyme activity) than at 25 ° C.

For reference, the measurement time of repeatedly of 100 times was the longest about 15 minutes (the shortest was about 7 minutes).

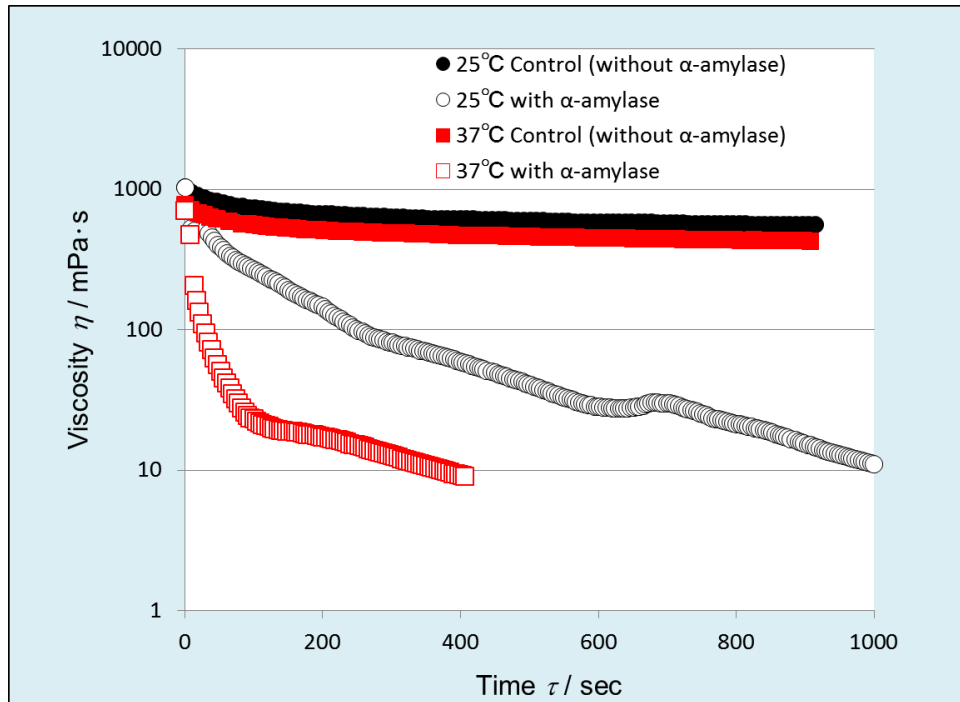


Figure 1. Change in viscosity in degradation process of gelatinized starch

8. Summary

The enzymatic degradation activity of α -amylase could be evaluated by viscosity variation in the degradation process of starch used the EMS viscometer.

It was suggested that the EMS viscometer could be used for investigation and evaluation in the optimal enzyme concentration, temperature and anaerobic conditions that maximize the ability of the enzyme.

9. References

None.