

Application Note

Change in viscosity in gelatinization process

Industry	:	Food & beverage
Instrument	:	Viscometer
Measurement method	:	Electro Magnetically Spinning Method
Standards	:	

1. Scope

Gelatin has characteristics such as water retention, binding, stabilization and emulsification, as well as its characteristic of maintaining the typical shape of dessert jellies.

In recent years, for household dish that is distributed in chilled state, it is a substance that is often used in foods compatible with microwave ovens that support contemporary food culture such as prevention of deformation during distribution and quality preservation, gelation of soups.

An example of measuring of the dynamic viscosity in gelatinization process of gelatin solution using an EMS viscometer that can be measured by sealing, sterilization and non-contact was shown below.

2. Precautions

When performing measurement below the ambient temperature, make sure to introduce dry air to the instrument before starting measurement in order to prevent dew condensation.

3. Post-measurement procedure

The sample container and the sample are discarded appropriately.

4. Apparatus

- EMS Viscometer
- Control Laptop PC
- Dry Air Unit
- Compressor

5. Reagents

- Sample : Jelly solution
(solution that puts board gelatin 0.75g in water 30mL and melts by heating at 60°C)

6. Procedure

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

✧ Measurement mode	:Sequence mode
✧ Measurement temperature	:0-25°C (5°C interval)
✧ Motor rotation speed	:1,000 rpm
✧ Measurement time	:1 (1 second)
✧ Repeat count	:100 times (measurement is interrupted when cured)
✧ Measurement interval	:5 seconds
- 2) Place an aluminum spherical probe of ϕ 2 mm and the sample in the solid state to a container, cover with a cap and packing, set the sample container in the EMS Viscometer, and click the measurement button.
- 3) Set another sample container with the sample into the instrument and change the temperature after the measurement of the first sample is completed. After about 10 minutes, measure it in sequence.

7. Example

The viscosity change in curing process is shown in Figure 1. And the viscosity result extracted in 30 seconds interval at each temperature is shown in Table 1. The cure rate is changed largely depending on the measurement temperature.

Jerry solution is cured more rapidly as the temperature is lower, and its viscosity hardly changed, even if 10 minutes has passed from the start of the measurement at 20°C or more.

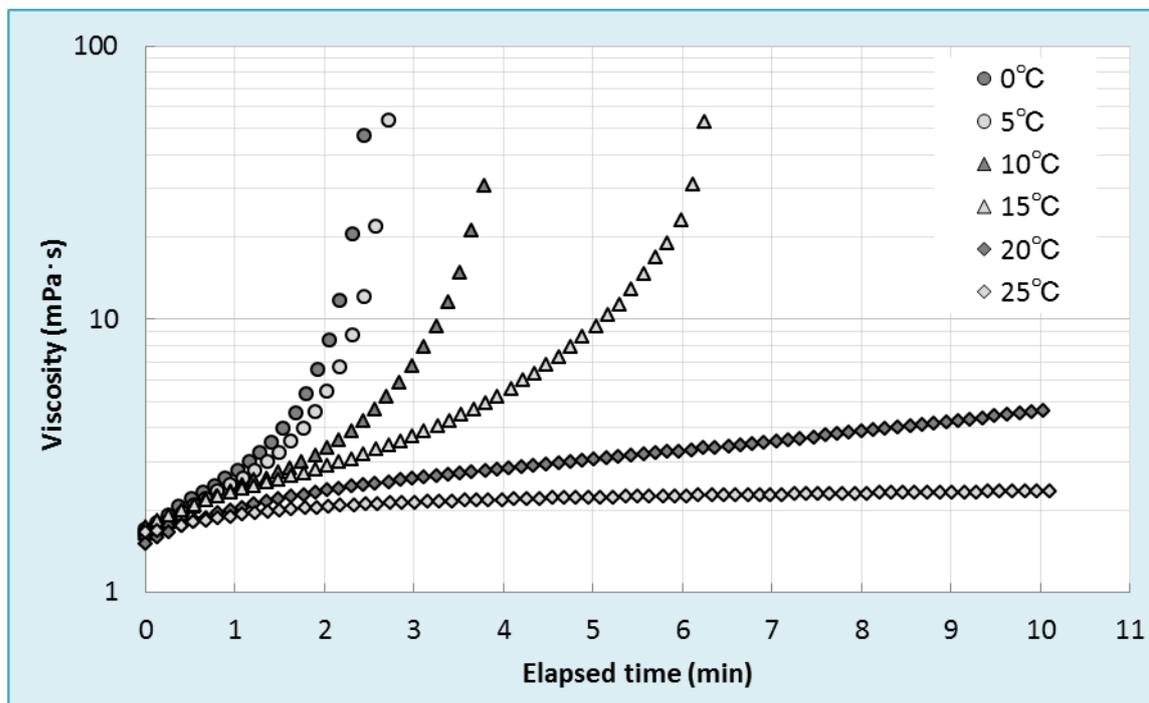


Figure 1. Viscosity change in curing process of gelatin

Table 1. Viscosity result extracted in 30 seconds interval

(mPa·s)

Elapsed time (min)	Temperature (°C)					
	0	5	10	15	20	25
0	1.69	1.61	1.64	1.67	1.52	1.66
0.5	2.19	2.08	2.06	2.01	1.83	1.81
1.0	2.78	2.48	2.49	2.25	2.00	1.90
1.5	3.96	3.24	2.76	2.52	2.20	1.99
2.0	8.41	5.42	3.37	2.82	2.36	2.05
2.5	47.0	21.8	4.68	3.09	2.48	2.10
3.0			6.76	3.57	2.60	2.14
3.5			14.8	4.24	2.72	2.16
4.0				4.94	2.81	2.19
4.5				6.34	2.94	2.20
5.0				8.60	3.06	2.22
5.5				11.3	3.16	2.24
6.0				18.9	3.29	2.25
6.5				85.0	3.43	2.27
7.0					3.55	2.28
7.5					3.71	2.29
8.0					3.88	2.30
8.5					4.01	2.31
9.0					4.20	2.33
9.5					4.41	2.33
10.0					4.63	2.35

8. Summary

The curing process of gelatin can be confirmed numerically.

It is one of the features for EMS viscometer that sample volume is less compared with the conventional method and temperature control is very fast. Because cooling time from 25 °C to 0 °C is also only about 10 minutes, it is possible to evaluate the physical properties of the sample in a short time.

9. References

None.