Application Note
Flow curve of commercial dressings

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

1. Overview

Xanthan gum is a common ingredient in salad dressings, acting as a dispersing and thickening agent. It becomes viscous when mixed with water, making it ideal as a thickener and stabilizing agent in not only dressings, but sauces, retort pouch foods, frozen meals, and other products. In this application note, the measurement of the dynamic viscosity of 2 commercially available salad dressing products containing xanthan gum over a sequence of rising and declining shear rates, using the EMS Viscometer, a non-contact viscometer that uses autoclavable and airtight sample tubes, is shown.

2. Precautions

None.

3. Post-measurement procedure

All sample tubes and samples are discarded according to proper waste disposal procedures.

4. Apparatus

- EMS Viscometer
- Control Laptop PC

5. Reagents

- Samples: Green perilla dressing (commercially available),
  Italian dressing (commercially available)

6. Procedure

1) Select sequence mode in the control software and set the following measurement parameters:

✧ Temperature	: 25°C
✧ Motor rotation speed	:I Rise(200→400→600→800→1,000rpm) II Descent (800→600→400→200rpm)
✧ Meas. time	: I (1 second) ~ III (10 seconds)
✧ Repeat times	: 3 times
✧ Meas. interval	: 1 second
✧ Hold time	: 0 sec

2) Transfer a 2mm diameter aluminum probe (φ2mm) and 300µL of sample into a sample tube, seal it with its tube cap and packing, set the sample tube into the EMS Viscometer, and then click the measurement button.

3) After measuring the first sample, measure the remaining samples using the same parameters.

7. Results & Discussion

Flow curves for both dressings are shown in Figure 1, with the data for their viscosities over a range of shear rates is displayed in Table 1. The coefficient of variation (CV) for data sets using viscosity measurements at all viscometer motor rpm settings stayed below 5%.

A possible explanation for the comparatively higher CV values observed in the viscosity data for the italian dressing, is that there is a higher content of particulate matter (finely chopped herbs and vegetables), to potentially collide with the spinning probe, slightly affecting results.

It took approximately 3 and a half minutes each to measure and have flow data plotted for these samples.

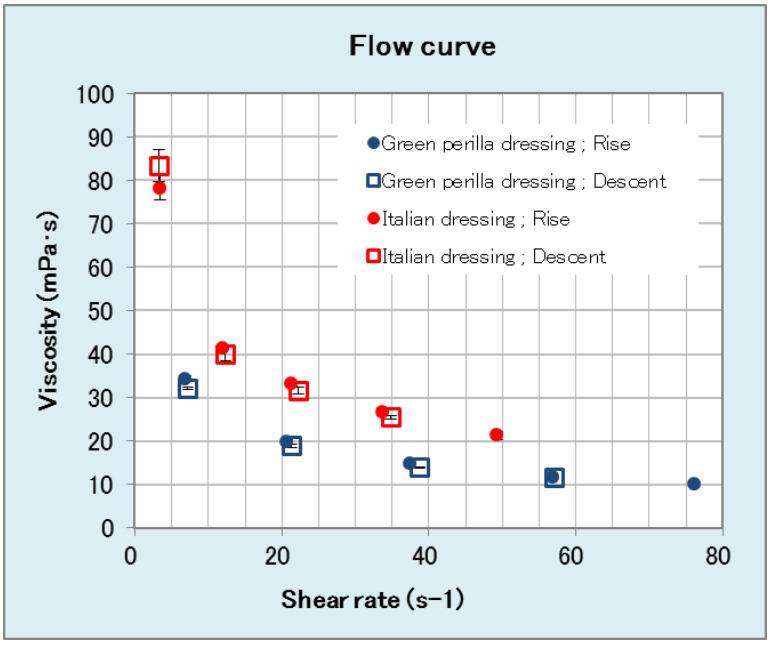

Figure 1. Flow curves for Green Perilla and Italian dressing

Table 1. The viscosity of dressings at varying shear rates

		Green perilla dressing						Italian dressing					
		Viscosity (mPa･s)			Shear rate (s-1)			Viscosity (mPa･s)			Shear rate (s-1)		
No.	Motor rotation speed (rpm)	Ave (n=3)	SD (n=3)	CV (n=3)	Ave (n=3)	SD (n=3)	CV (n=3)	Ave (n=3)	SD (n=3)	CV (n=3)	Ave (n=3)	SD (n=3)	CV (n=3)
1	200	34.33	0.551	1.6%	6.86	0.087	1.3%	78.20	2.762	3.5%	3.45	0.110	3.2%
2	400	19.70	0.458	2.3%	20.73	0.314	1.5%	41.37	0.351	0.8%	11.94	0.096	0.8%
3	600	14.70	0.265	1.8%	37.44	0.505	1.3%	33.20	0.529	1.6%	21.36	0.272	1.3%
4	800	11.67	0.058	0.5%	56.92	0.091	0.2%	26.63	0.907	3.4%	33.67	0.791	2.3%
5	1000	10.13	0.058	0.6%	76.13	0.091	0.1%	21.23	0.950	4.5%	49.32	1.414	2.9%
6	800	11.63	0.058	0.5%	56.97	0.091	0.2%	25.43	0.462	1.8%	34.82	0.453	1.3%
7	600	13.83	0.058	0.4%	38.75	0.091	0.2%	31.60	0.781	2.5%	22.20	0.363	1.6%
8	400	18.83	0.321	1.7%	21.31	0.240	1.1%	39.90	1.556	3.9%	12.32	0.378	3.1%
9	200	32.17	0.231	0.7%	7.22	0.045	0.6%	83.43	3.691	4.4%	3.26	0.126	3.9%

8. Summary

Using the EMS Viscometer in sequence mode, it was possible to measure the viscosity and generate flow curves for dressing samples in approximately 3 and a half minutes/sample.

It was observed that the viscosities of the sample at the same shear rate were roughly the same regardless of the measurement point being taken during the rising or descending point of the sequence. This indicates that the sample's higher-order structure was not compromised and that we can assume that the flow curve data is reliable.

9. References

None.