Application Note

Temperature dependence of melt viscosity of candle

Industry	:	Petroleum, Energy
Instrument	:	Viscometer
Measurement method	:	Electro Magnetically Spinning Method
Standards	:	

1. Scope

The EMS viscometer is an instrument that can get sample information in a test tube in real time with built-in camera.
Examples of measuring the temperature dependence of the dynamic viscosity of candles using an EMS viscometer that can be measured by sealing, sterilization and non-contact were 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 : Japanese candle made of domestic beeswax, Candle made of paraffin wax

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6. Procedure

1) Enter the following conditions in measurement condition of the sequence mode of control software.
   - ✧ Measurement mode :Sequence mode
   - ✧ Measurement temperature :100 → 50℃(5℃ interval)
   - ✧ Motor rotation speed :1,000 rpm
   - ✧ Measurement time :I (1 second)
   - ✧ Repeat count :10 times
   - ✧ Measurement interval :5 seconds
   - ✧ Waiting time for temperature stability :10 minutes
2) Place an aluminum spherical probe of φ 2 mm and a the sample in the solid state to a container, cover with a cap and packing, set the sample container in the EMS Viscometer controlled to 100℃.
3) Click the measurement button after confirming that the sample has melted by the built-in camera.

7. Example

The measurement results about the temperature dependence of the melt viscosity of candle are shown in Figure 1 and Table 1, 2.
Japanese candle made of domestic beeswax is melted at 65℃ or more and the candle made of paraffin wax is melted at 60℃ or more. The temperature dependence of the melt viscosity can be measured.
Moreover, the melt viscosity of Japanese candle made of domestic beeswax at each temperature is able to obtain a high value compared with that of the candle made of the paraffin wax.

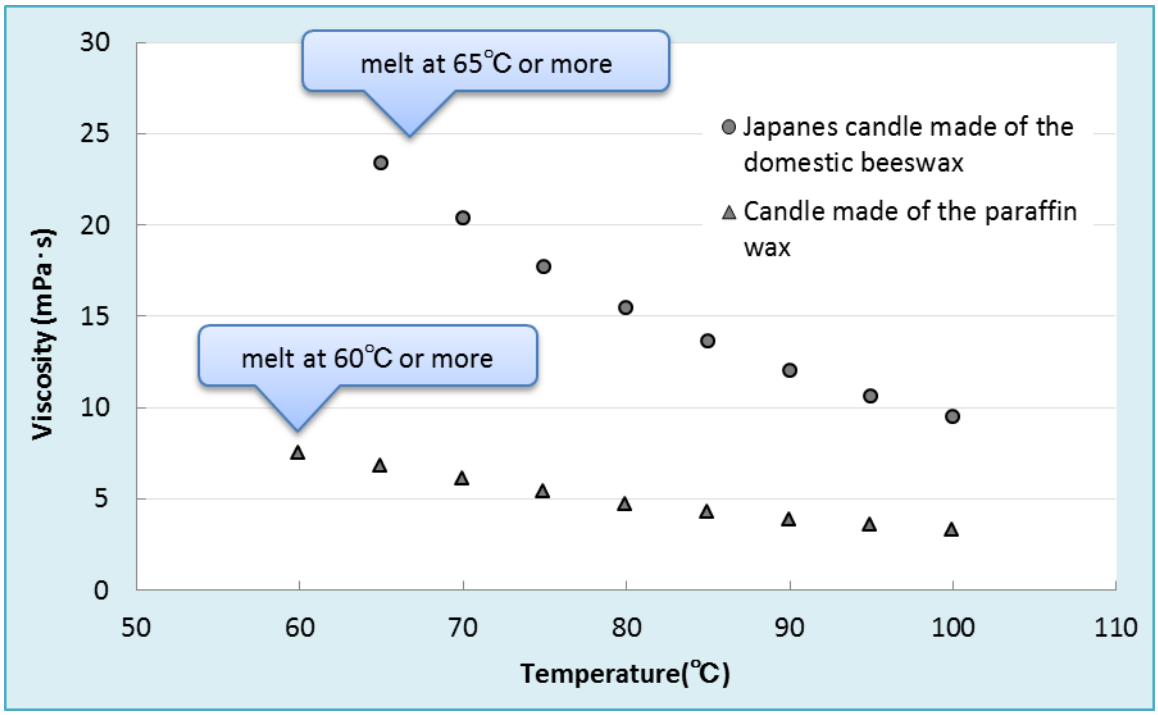


Figure 1. Measurement result about the temperature dependence of the melt viscosity of the candle

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Table 1. Measurement result about the temperature dependence of the melt viscosity of Japanese candle made of domestic beeswax

(mPa･s)

Frequency of measurement	Temperature (℃)							
	65	70	75	80	85	90	95	100
1st	23.5	20.3	17.4	15.4	13.6	12.1	10.6	9.50
2nd	23.5	20.4	18.0	15.4	13.6	12.0	10.6	9.52
3rd	23.3	20.3	17.6	15.5	13.6	12.0	10.6	9.53
4th	23.4	20.4	17.7	15.4	13.6	12.0	10.6	9.51
5th	23.5	20.4	17.8	15.4	13.6	12.0	10.6	9.45
6th	23.3	20.4	17.8	15.4	13.6	12.0	10.6	9.50
7th	23.4	20.4	17.9	15.4	13.6	12.0	10.6	9.49
8th	23.5	20.3	17.7	15.5	13.6	12.0	10.6	9.48
9th	23.3	20.3	17.6	15.4	13.6	12.0	10.6	9.46
10th	23.3	20.2	17.7	15.4	13.6	12.0	10.6	9.51
Mean	23.4	20.3	17.7	15.4	13.6	12.0	10.6	9.50
Standard deviation	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.03
RSD (%)	0.40	0.34	0.95	0.27	0.00	0.26	0.00	0.3

Table 2. Measurement result about the temperature dependence of the melt viscosity of the candle made of paraffin wax

(mPa･s)

Frequency of measurement	Temperature (℃)								
	60	65	70	75	80	85	90	95	100
1st	7.68	6.82	6.06	5.42	4.69	4.35	3.95	3.54	3.35
2nd	7.65	6.80	6.02	5.46	4.90	4.32	3.83	3.60	3.28
3rd	7.50	6.85	5.94	5.31	4.86	4.27	3.86	3.58	3.32
4th	7.56	6.84	6.35	5.31	4.68	4.24	3.87	3.55	3.30
5th	7.46	7.03	6.31	5.40	4.70	4.22	3.86	3.53	3.28
6th	7.63	6.80	6.09	5.37	4.66	4.21	3.85	3.68	3.32
7th	7.54	6.80	6.02	5.35	4.66	4.27	3.91	3.64	3.30
8th	7.51	6.79	5.99	5.49	4.69	4.26	3.99	3.58	3.47
9th	7.46	6.91	6.29	5.39	4.68	4.29	3.92	3.58	3.29
10th	7.53	6.87	6.20	5.48	4.71	4.26	3.83	3.52	3.27
Mean	7.55	6.85	6.13	5.40	4.72	4.27	3.89	3.58	3.32
Standard deviation	0.08	0.07	0.15	0.07	0.08	0.04	0.05	0.05	0.06
RSD (%)	1.0	1.1	2.4	1.2	1.8	1.0	1.4	1.3	1.8

8. Summary

Temperature dependence of the melt viscosity of the candle can be measured easily by putting a cut solid candle in the sample container and heating it.

Moreover, the difference of the melt temperature can be confirmed depending on the difference of the material.

9. References

None.

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