

Flow Characteristics of KEPITAL

R&D Center

1. Basic principle

Melt Index, Melt Flow Length and Viscosity are measurements of the flow characteristics of plastics. This article will clarify the flow characteristics of KEPITAL standard grades.

2. Flow characteristics

(1) Melt Index (MI)

Grade		Unit	Melt Index	Molecular Weight
F10-03H	High viscosity	g/10 min	3	High ↓ Low
F20-03	Medium viscosity		9	
F30-03	Low viscosity		27	
F40-03	Ultra-low viscosity		48	
F40-34	Extreme-ultra-low viscosity		68	

* Test condition : 190 °C, 2160 g

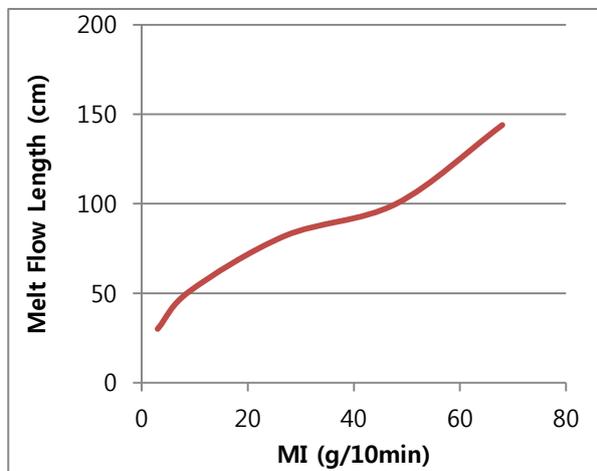
- 1) KEPITAL Standard Grades are distinguished according to viscosity, and Melt Index is measured in accordance with ISO 1133.
- 2) F10-03H has the lowest Melt Index among the standard grades, and we can conclude that F10-03H has high viscosity. (We call it the high-viscosity grade.)
- 3) The number associated with the name of the KEPITAL grade(FXX) increases according to Melt Index. [F20-03(medium-viscosity grade) represents our standard grade.]

(2) Melt Flow Length by injection pressure

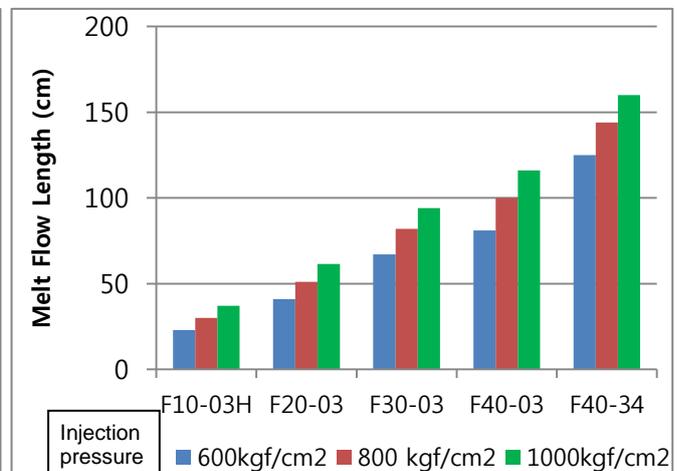
Grade	Unit	Melt Flow Length		
		600 kgf/cm ²	800 kgf/cm ²	1,000 kgf/cm ²
F10-03H	cm	23	30	37
F20-03		41	51	62
F30-03		67	82	94
F40-03		81	100	116
F40-34		125	144	160

*Injection conditions : Injection speed : 50 mm/s, resin temperature : 190 °C, mold temperature : 80 °C

- 1) Melt Flow Length is one way to measure flow characteristics of resin and measures the length of melt resin pushed out by pure injection pressure without holding pressure at a fixed speed.
- 2) As you can see in the above table, Melt Flow Length increases as injection pressure increases but the rate of change is different.
- 3) As the viscosity of a grade lowers, the Melt Flow Length increases through injection pressure.



<Figure 1. Melt Flow Length by MI>



<Figure 2.Melt Flow Length by grades>

(3) Viscosity

1) Definition : the stickiness of a fluid, the resistance against flow.

In particular, the viscosity of plastics means the degree of flow at the melted state and viscosity tends to decrease as temperature increase.

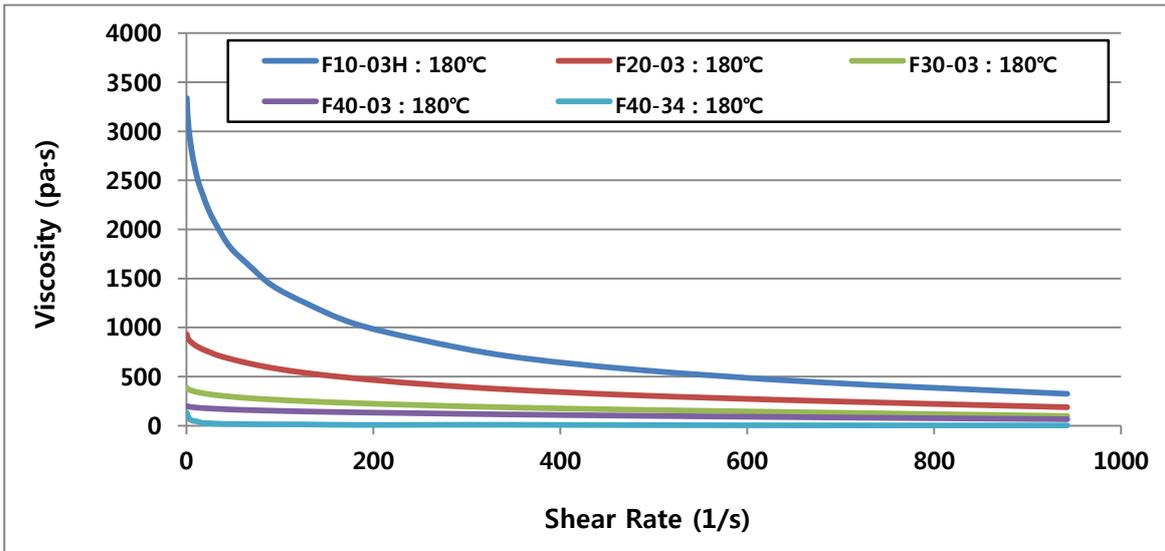
2) Test machine and condition

- Type : Rotational Rheometer

- Model : Hakke MARS-3

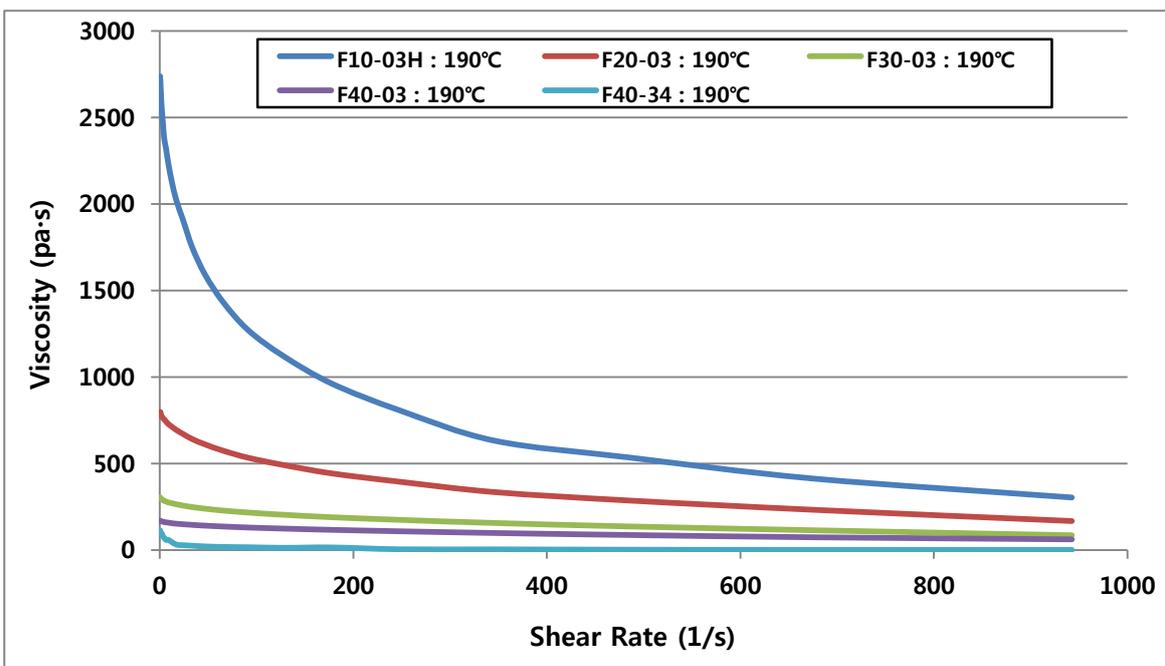
- Test condition : Shear Rate 0 Hz ~ 1000 Hz, Temperature : 180 ~ 210 °C

3) Temperature 180 °C



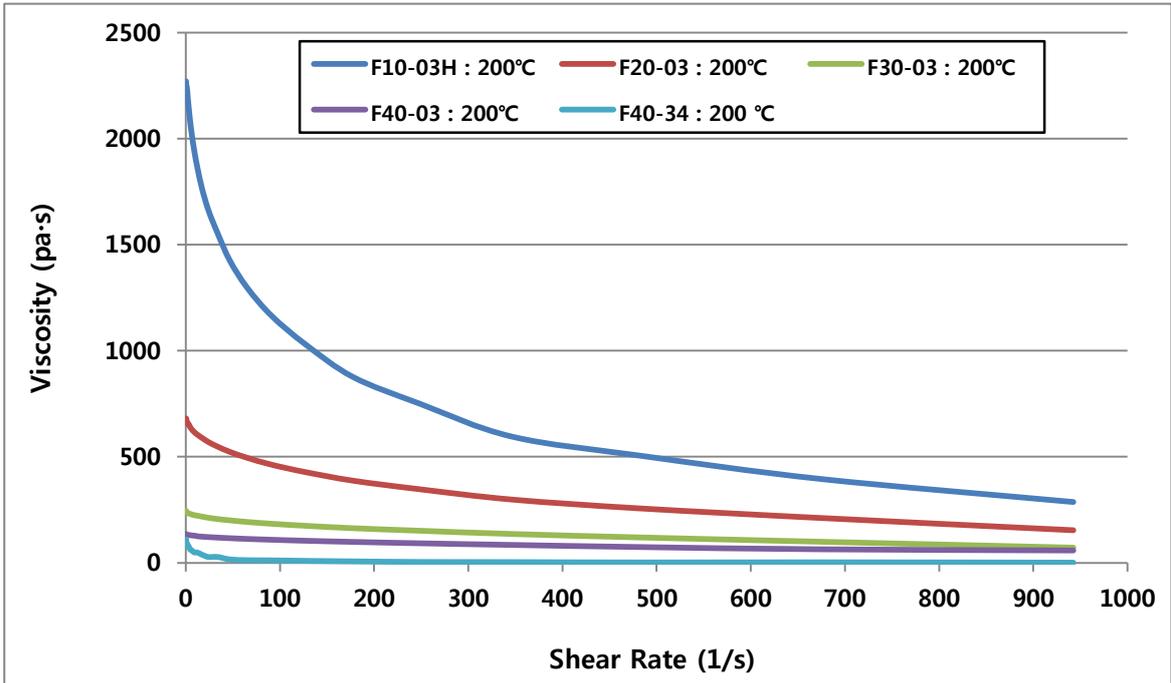
<Figure 3. Viscosity test result for KEPITAL Standard Grade (180 °C)>

4) Temperature 190 °C



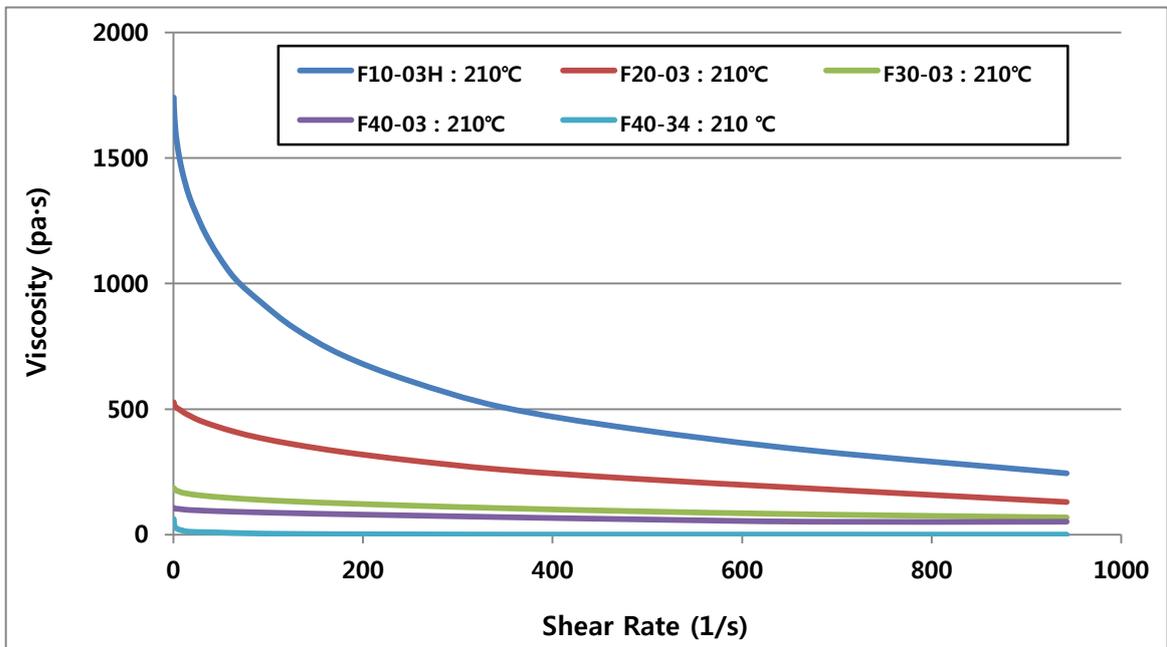
<Figure 4. Viscosity test result for KEPITAL Standard Grade (190 °C)>

5) Temperature 200°C



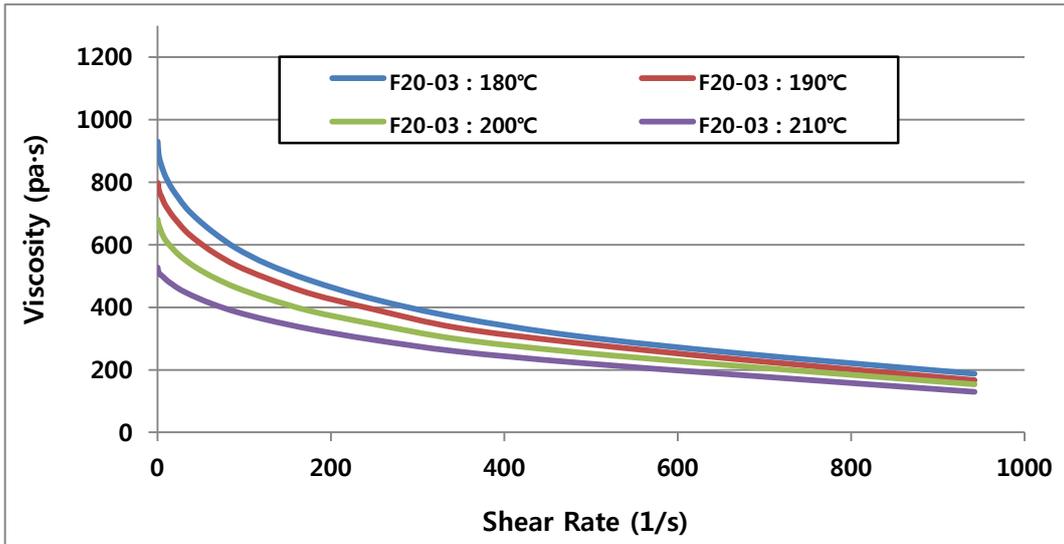
<Figure 5. Viscosity test result for KEPIAL Standard Grade (200 °C)>

6) Temperature 210 °C



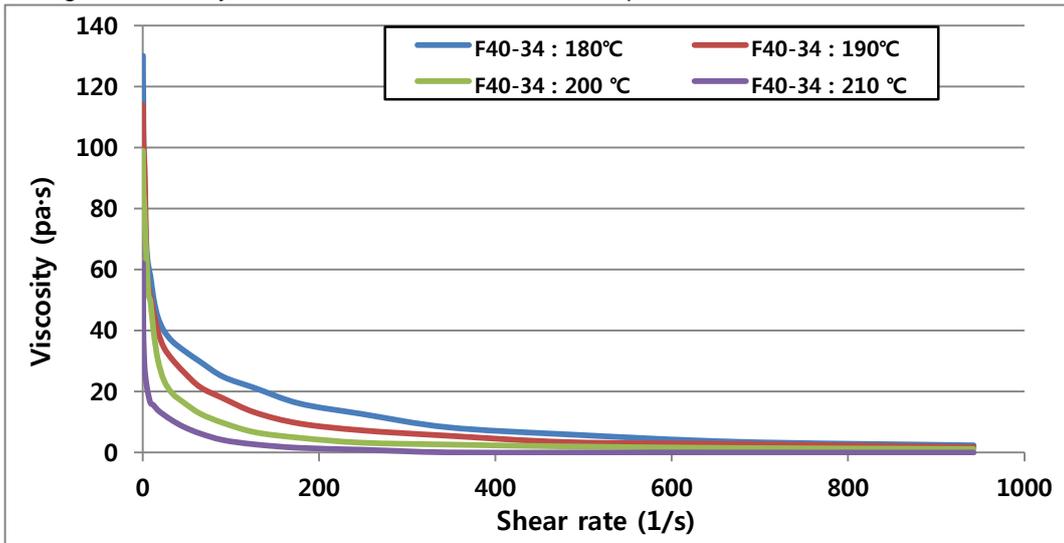
<Figure 6. Viscosity test result for KEPIAL Standard Grade (210 °C)>

7) Change of viscosity of F20-03 in connection with temperature



<Figure 7. Change of viscosity of KEPITAL F20-03 in connection with temperature>

8) Change of viscosity of F40-34 in connection with temperature



<Figure 8. Change of viscosity of F40-34 in connection with temperature>

Viscosity of KEPITAL Standard Grade increases as its molecular weight increases.

F10-03H > F20-03 > F30-03 > F40-03 > F40-34

- ① Viscosity increases as molecular weight increases.
- ② Viscosity decreases as temperature increases.
- ③ When temperature rises, there is more movement of polymer chains, the distance between molecules increases, and the resistance to flow decreases due to free volume allowing greater movement of molecules.
- ④ Viscosity of KEPITAL decreases as its shear rate increases.
(This is called the Shear-thinning phenomenon.)

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