



## **Introduction of KEPITAL<sup>®</sup> ST-XX Grades**

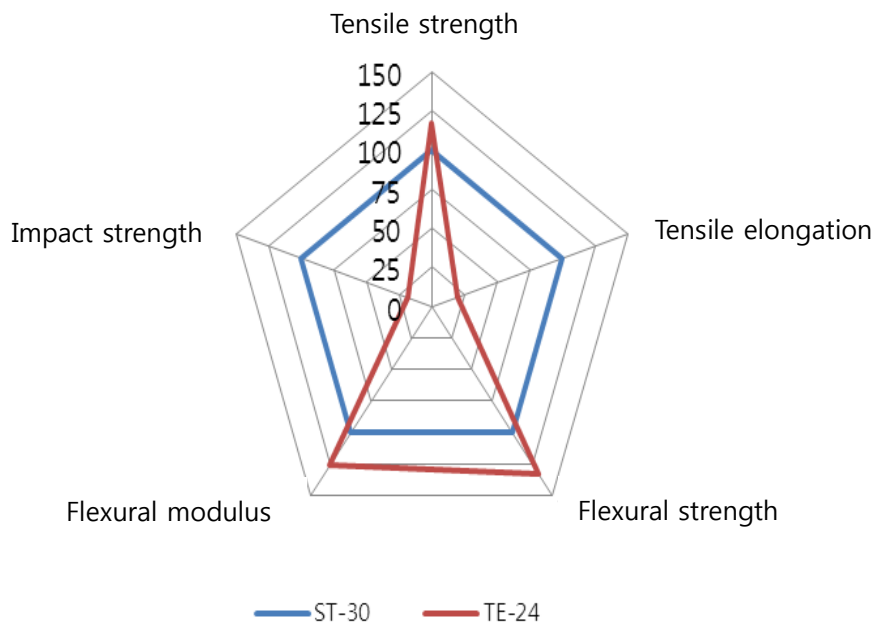
**R&D Center**

## 1. Characteristics

KEPITAL<sup>®</sup> has outstanding properties due to its linear molecular structure $[(-CH_2-O-)(-CH_2-CH_2O-)]$  and a high crystallinity(65%). KEPITAL<sup>®</sup> has excellent fatigue and creep resistance, and is less affected by fuel and as such is widely used in fuel components. Hardness can be understood to mean inflexible and relatively low impact strength. KEPITAL<sup>®</sup> ST-30, ST-50, ST-70 are specialized products regarding flexibility and toughness with extremely enhanced impact strength while retaining the basic properties of KEPITAL<sup>®</sup>. KEPITAL<sup>®</sup> ST-series are useful for parts which require high impact resistance such as toys, reduced impact noise, and superior friction resistance and impact strength such as gears.

## 2. Comparison with our existing products

KEPITAL<sup>®</sup> ST-series feature greatly improved impact strength and tensile elongation compared to our existing impact resistance grades.



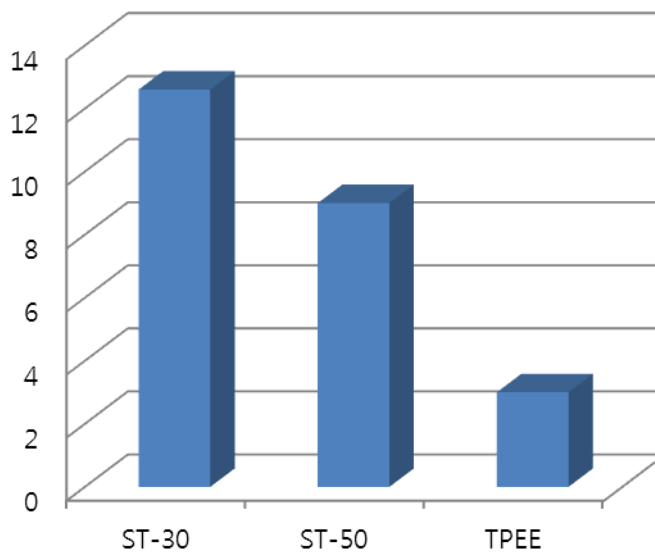
**Figure 1.** KEPITAL<sup>®</sup> ST-30 vs. our existing impact resistance grade(KEPITAL TE-24)

### 3. Mechanical properties

#### (1) Mechanical properties

Classification	Test	Unit	TPEE*	KEPITAL ST-30	KEPITAL ST-50	KEPITAL ST-70
Density	ISO 1183	g/cm <sup>3</sup>	1.26	1.33	1.28	1.25
Tensile strength	ISO 527	MPa	26	35	25	17
Nominal strain at break		%	300 ≤	300 ≤	300 ≤	300 ≤
Flexural strength	ISO 178	MPa	-	40	26	10
Flexural modulus		MPa	550	1,150	800	320
Charpy impact strength (23°C, notched)	ISO 179	kJ/m <sup>2</sup>	Partial break	100	N.B.	N.B.

#### (2) Low temperature impact strength

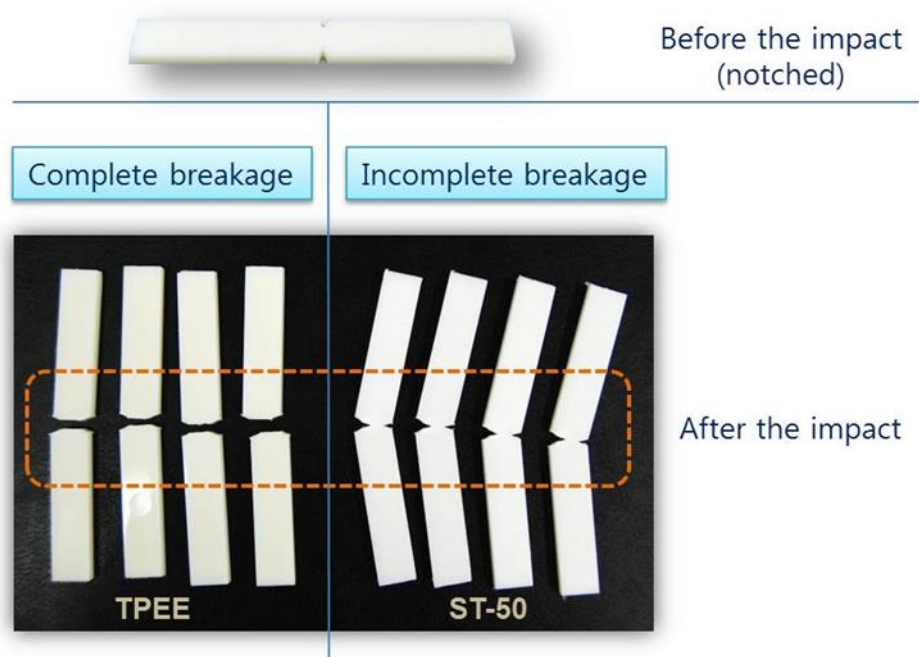


**Figure 2.** Charpy impact strength (Notched @ -40 °C, unit : kJ/m<sup>2</sup>)

At low temperatures, TPEE cracks easily and breaks under even small impacts due to its heavily decreased impact strength. On the contrary, KEPITAL® ST-series grades retain their characteristics even at low temperatures since its impact strength is about 3 to 5 times higher than TPEE.

### (3) Impact strength

A typical impact strength test determines the value of strength, which occurs when impacting one side of a notched sample (v-notched). In this test, the sample is notched on both sides and impacted on one side. The sample is easily breakable because of decreased strength resistance area when it has a both-sided notch. Even though ST-50 has notches on both sides, partial breaks occurred. On the other hand, you can see the clear break that occurred on TPEE. In addition, it seems that the impact strength of ST-50 is 10 times higher than TPEE. KEPITAL ST-series can supply a grade which is superior to thermoplastic rubbers and features suitable product characteristics.



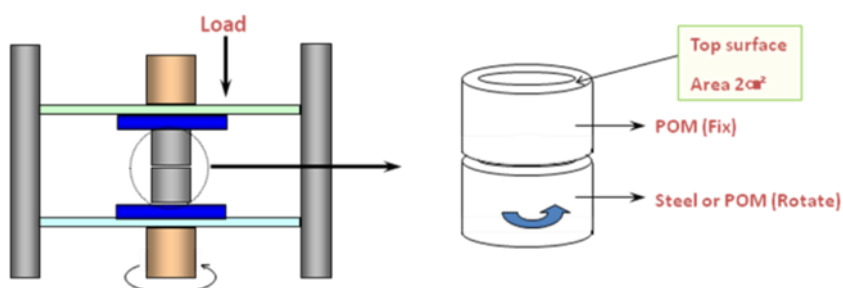
**Figure 3.** Both-sided notched impact strength

Classification	Hammer size	Unit	TPEE	KEPITAL ST-50
Both-sided notched impact strength	25J	kJ/m <sup>2</sup>	17	172

#### (4) Friction and wear property

Good friction and wear property, which is one of the unique characteristics of KEPITAL®, is by far the highest level among the other resins. KEPITAL® has a low friction coefficient at engaging parts and represents smaller abrasion loss than competitors and other resins. With these natural characteristics, KEPITAL ST-series increases impact resistance and toughness. Therefore, it can be used for various area and products compared with thermoplastic rubber materials.

Classification	Resin vs. Resin (Same Resin)	
	Dynamic friction coefficient ( - )	Specific wear (mm <sup>3</sup> /kgf.km)
<b>KEPITAL ST-50</b>	<b>0.41</b>	<b>1.00</b>
<b>TPEE</b>	<b>0.55</b>	<b>4.17</b>

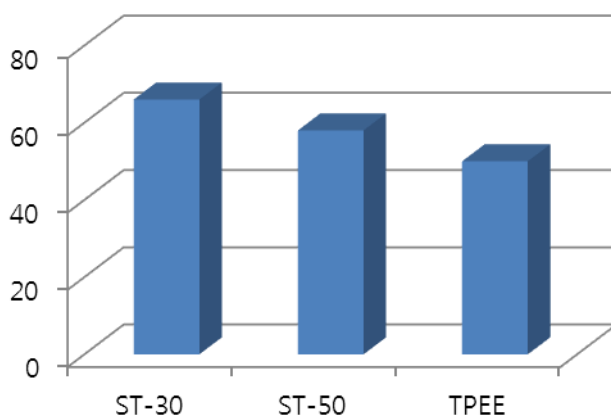


\* Test condition : Speed 100 mm/s, Load 50 N, Running time 1 hour

**Figure 4.** The friction and wear test method

#### (5) Heat deflection temperature (HDT)

As TPEE has only rubber properties, deformation occurs at lower temperatures. On the other hand, KEPITAL® ST grade has a great advantage as deformation occurs only in relatively high temperatures than the accepted temperature range.

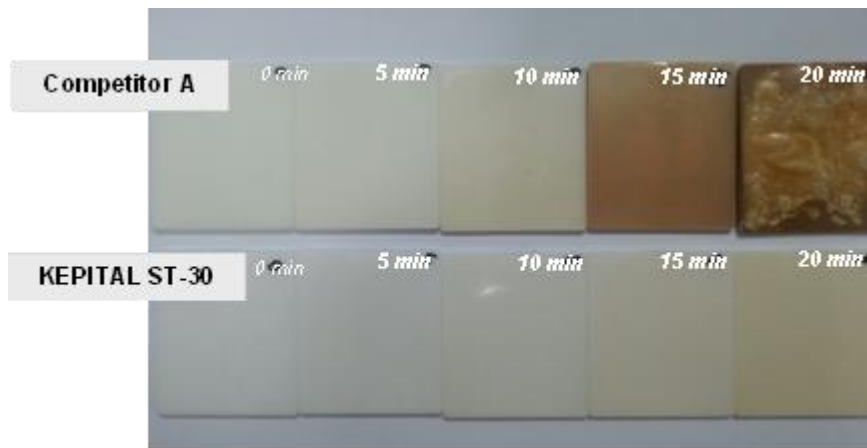


**Figure 5.** Heat deflection temperature (°C) @ 1.8 MPa

## (6) Thermal stability

KEPITAL® ST-30 exhibits less color change than competitor products when it remains for an extended time inside the injection molding machine. Refer to Figure 6 below.

This means KEPITAL® ST-30 is superior to competitor products in thermal stability. For these reasons, the risk for problem occurrence in injection is low and as such it is a powerful advantage.



**Figure 6.** Color change in condition with retention time (inside injection molding machine)

## 4. Applications



Ski binders

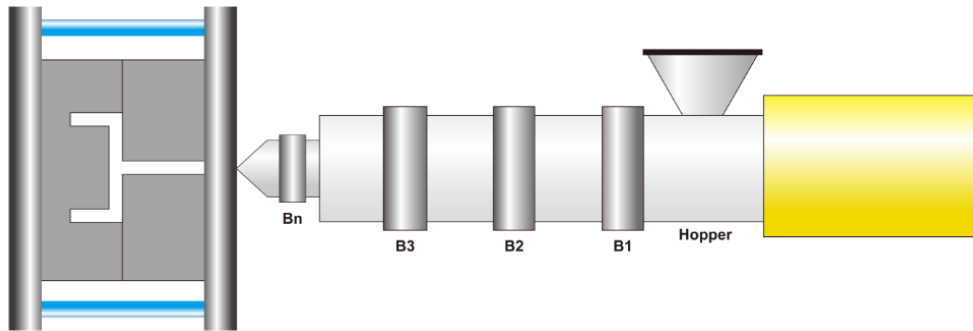


Gears



Toy parts

## 5. Injection molding conditions



### Pre-drying(Suggested max. moisture : 0.1 %)

It is recommended to dry material at 80 °C ~ 100 °C (176 °F ~ 212 °F) for 3 h ~ 4 h if necessary.

### Temperature

Mold temperature : 30 °C ~ 50 °C(86 °F ~ 122 °F)

Barrel temperature : 170 °C ~ 190 °C(338 °F ~ 374 °F)

Mold	Bn (Nozzle)	B3 (Metering)	B2 (Compression)	B1 (Feeding)	Hopper
30 ~ 50 °C	185 ~ 190 °C	180 ~ 185 °C	175 ~ 180 °C	170 C ~ 175 °C	60 ~ 80 °C
86 ~ 122 °F	365 ~ 374 °F	356 ~ 365 °F	347 ~ 356 °F	338 ~ 347 °F	140 ~ 176 °F

### Plastification

Screw speed : 150 mm/s ~ 200 mm/s

Back pressure : Maximum 20 bar

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