

# **“TOYOLAC” Painting Grade ABS Resin**

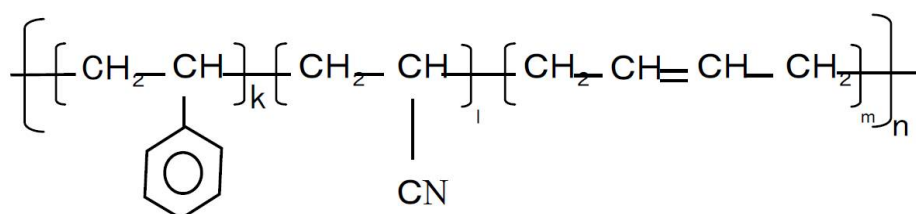
## Technical Guide

**Toray Plastics (Malaysia) Sdn. Bhd.**  
Penang (Head Office)  
2628 MK1, SPT., Lorong Perusahaan 4,  
Prai Free Industrial Zone,  
13600 Prai, Penang, Malaysia.  
TEL: +60-4-3988088  
FAX: +60-4-3908975

## **1. INTRODUCTION**

“TOYOLAC” is the trade name of Toray’s thermoplastics that is known as ABS polymers (Acrylonitrile-Butadiene-Styrene resin) in regular use for the past thirty years. The chemical structure of ABS resin is shown as below.

“TOYOLAC” has “lightness”, “toughness” and “attractive appearance”, and ensures excellent mechanical, thermal, chemical, electrical properties and well balanced mold ability. It is used in wide range of applications including industrial material and household articles.



The objective of this Technical Guide is to introduce Painting Grade TOYOLAC ABS which offers consistent supply with competitive price.

## **2. FEATURES OF PAINTING GRADE OF “TOYOLAC”**

### **Excellent paintability**

- It can be used for painting applications such as motorcycle and automobile, which required excellent textures after painting.
- It can solve several paintings defects such as crazing and cracking, which often occur on general purpose ABS resin.

### **Balance of flowability**

- It shows good flowability which eases the molding process and subsequently reduces residual stress on molded part, in which such residual stress prone to cause crazing and cracking after painting.

PAINTING 涂装型										
Property 代表物性	Test Method 试验法	Test Condition 试验条件	Units 单位	Painting 涂装					High Heat Painting 高耐热 涂装	
			Type 型号	100	100	100	100	100	440Y	450Y
			Suffix 区分字符	MPM	MPF	MPH	MPJ	MPK	X50	X50
ISO STANDARD										
Melt Flow Rate 流动系数	ISO 1133	220°C / 10 kg	g/10min	18	15	15	30	35	14	12
Charpy Impact Strength (notched) 缺口冲击强度	ISO 179/1eA	23°C / 50 %RH	kJ/m <sup>2</sup>	24	28	16	25	21	16	12
Deflection Temperature Under Load 热变形温度	ISO 75	1.8 MPa / 120°C/hr	°C	80	78	84	77	78	90	93
Tensile Strength 引张强度;降伏点	ISO 527	50 mm/min	MPa	46	43	57	43	46	48	50
Tensile Elongation at Break 拉伸伸长率			%	>10	>10	>10	>10	>10	>6	>6
Tensile Modulus 拉伸模数		1 mm/min	MPa	2300	2000	-	2200	2300	-	-
Flexural Strength 弯曲强度	ISO 178	2 mm/min	MPa	68	59	86	64	68	75	77
Flexural Modulus 弯曲模数				2100	1830	2610	2100	2200	2400	2540
Density 比重	ISO 1183	23°C	kg/m <sup>3</sup>	1030	1030	1050	1040	1030	1050	1060
Flammability 燃烧性	UL94 File No. E41797			HB	HB	-	HB	HB	HB	HB

Note: The above values are typical data for the products under specific test conditions and not intended for use as limiting specifications.

「以上数据谨代表在特定条件下所得的测定值的代表例」

Table 1: Catalogue Properties Data

### 3. Processing

#### Drying

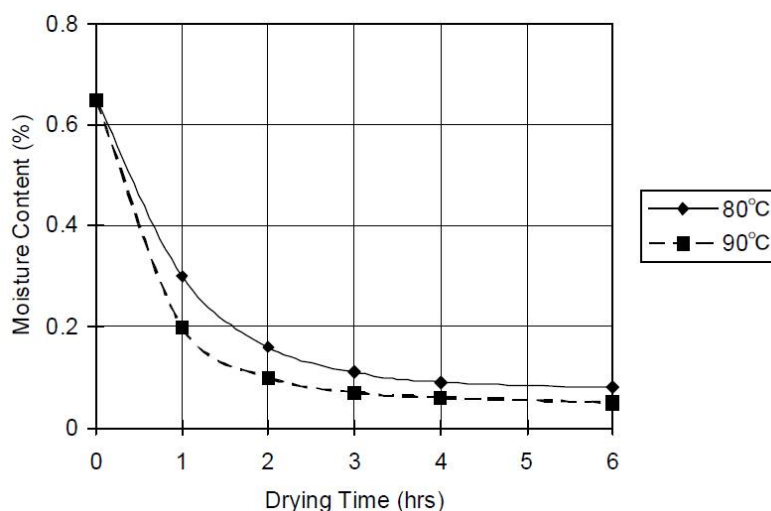
Commonly, ABS resin absorbs moisture in proportion to environmental humidity. The absorbing process of moisture is a reversible process. Therefore, moisture of wet pellets will be lost to environmental air with lower humidity. Dried pellets should absorb moisture until the amount touches equilibrium amount with the moisture in the air. The absorbing moisture content depends on the relative humidity in the air and how long the resin was exposed.

While “TOYOLAC” ABS resin is exposed to humidity, the moisture is absorbed onto surface and into inside of the pellets itself or molded parts. Typical equilibrium moisture of “TOYOLAC” ABS is around 0.2~0.3% at 23°C, 50%RH, and 0.5~0.6% at 40°C, 95%RH. The rate of absorbed moisture depends on pellet size, shape and environmental temperature.

Non-dried ABS resin can cause silver streak problem on molded parts. The recommendable moisture content for “TOYOLAC” ABS is less than 0.1%, more desirable is 0.05%. Generally, below drying conditions are recommended.

*Drying Temperature: 80 ~ 90 °C  
Drying Time: 3 ~ 5 hrs*

Typical drying variables by using oven with internal air circulation are shown in Figure 1. It shows that longer drying time is required when initial moisture content is high.



*Fig 1 Drying Variables of “TOYOLAC” Painting Grade*

## **4. Injection Molding**

### **Injection Temperature**

Generally, the barrel temperature of injection molding machine should increase from the hopper to the nozzle gradually. “TOYOLAC” ABS starts softening generally around 90~110°C although it depends on grades. Typical barrel setting temperature is shown as below table.

Nozzle (°C)	Zone 4 (°C)	Zone 3 (°C)	Zone 2 (°C)	Zone 1 (°C)	Hopper (°C)
230 ~ 240	230 ~ 240	230 ~ 240	220 ~ 230	220 ~ 230	210 ~ 220

*Table 2: Recommended Barrel Setting Temperature*

It should be properly controlled according to the injection molding machines, the shapes and size of the products, and the mold structure. Excessive temperature recommended above could result in discoloration or burn marks problems. These are sign of damage to the material. Melt temperature of resin should be between 230°C and 250°C. It should be checked frequently and maintained within above recommended range to prevent defect of appearance and mechanical properties.

In order to prevent painting problems, such as crazing and cracking, it should be set at higher side, mainly to reduce residual stress on molded part which will cause crazing and cracking defects after painting.

If shutdown is required, remove the material from the machine and purge out completely to avoid burning trouble.

### **Injection Speed & Pressure**

Injection speeds will be depending on products shape, gate structure and runner dimensions. Basically moderate injection speed is preferable in order to prevent orientation of rubber particles due to excessive shear.

Injection pressure should be controlled to mold full parts consistently with acceptable appearance. Many parameters affects injection pressure, such as injection temperature,

products shape, nozzle and gate size, runner dimensions and mold temperature. Typical injection pressure range is 70~140MPa for “TOYOLAC” ABS. It is important that injection pressure should drop off to holding pressure after fill-up immediately.

### **Mold Temperature**

The mold temperature affects the surface quality and the level of residual stress in the molded products. To provide molded product having excellent surface finish and less residual stress, the mold temperature should be controlled as high as possible, ranging between 40°C ~ 80°C. However, higher mold temperature may cause longer cycle time and warpage problem. Excessive mold temperature should be avoided.

### **Purging**

General maintenance and equipment cleaning should include frequent purging with natural color ABS resin or AS resin. If prolonged shut-down is required, reduce barrel temperature less than 150°C, remove the material from the injection machine and purge with natural ABS resin or AS resin. Continue this operation until hopper is empty throughout and confirm barrel temperature has been dropped less than 150°C.

### **Regrind**

Runners, sprues and shot-shots of “TOYOLAC” ABS molded under proper molding conditions can be used for recycle materials. Non-degraded regrind up to a 20% can be reprocessed with fresh pellets of the same grade. Please do not mix with other grades of “TOYOLAC” ABS resin or other plastics. Drying is necessary before reprocessing.

## 5. Troubleshooting

Typical molding problems and problem solutions are shown as following table. Most cause of molding troubles is the tangle of any kind of factors such as improper molding conditions, imperfect design of mold and moldings. Any one of the suggested remedies may solve a particular problem. However some problems may require a combination of suggested remedies.

Problems Remedy	Short Shots	Flash	Sink Marks	Burn Marks	Poor Weld Line	Low Gloss	Jetting	Excessive Warpage	Scratches	Air Marks	Silver Streaking	Crack, Whitening
Increase Injection Speed	✓		✓		✓	✓		✓				✓
Decrease Injection Speed				✓			✓			✓	✓	
Increase Injection Pressure	✓		✓		✓				✓			
Decrease Injection Pressure		✓		✓				✓			✓	✓
Increase Mold Temperature	✓				✓	✓	✓				✓	✓
Decrease Mold Temperature			✓					✓	✓			
Increase Barrel Temperature	✓				✓	✓	✓	✓				✓
Decrease Barrel Temperature		✓	✓	✓					✓		✓	
Decrease Nozzle Temperature				✓								
Increase Nozzle Temperature					✓	✓						
Check Nozzle, Sprue, Runner & Gate Size	✓		✓	✓			✓		✓		✓	✓
Check Gate Position & Number	✓				✓		✓		✓		✓	
Improve Venting	✓			✓	✓	✓				✓	✓	
Increase Filling Quantity	✓		✓						✓			
Decrease Filling Quantity		✓										
Check Clamping Force		✓										
Increase Holding Pressure						✓						
Decrease Holding Pressure		✓						✓				✓
Increase Holding Pressure Time			✓			✓						
Decrease Holding Pressure Time		✓						✓				✓
Increase Cooling Time			✓						✓			
Decrease Screw r.p.m.											✓	
Check Pellet Drying											✓	

*Table 3: Troubleshooting Guide for "TOYOLAC" Painting Grade ABS Resin*

**Important Notes:**

1. In as much as Toray Plastics (Malaysia) Sdn. Bhd. has no control over the use to which other may put this material, it does not guarantee that the same result as those described herein will be obtained. Nor does Toray Plastics (Malaysia) Sdn. Bhd. guarantee the effectiveness or safety of any possible or suggested design for articles of manufacturer as illustrated herein by any photographs, technical drawing and the like. Each user of the material or design or both should make his own tests to determine the suitability of the material or any material for the design, as well as suitability or suggested uses of the material or design described herein are not to be construed as constituting a license under any Toray Plastics (Malaysia) Sdn. Bhd. patent covering such use or as recommendations for use of such material or design in infringement of any patent.

2. The material described here is not recommended for medical application involving any implantation inside the human body. Material Safety Data Sheet (MSDS) for the materials concerned should be referred to before any use.