“TOYOLAC” ASA Resin

Technical Guide

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1.0 Introduction

ASA (Acrylonitrile Styrene Acrylate) is produced by introducing a grafted acrylate elastomer from BA (Butyl Acrylate) during copolymerization reaction between Styrene and Acrylonitrile. ASA imparts excellent resistance to discoloration, embrittlement and degradation from ultraviolet (UV) sunlight, atmospheric oxygen and heat from processing compared to ABS. Because of this attributes, ASA is an ideal material for automotive industry as well as several other outdoor applications which required long term performance

2.0 General Properties of "TOYOLAC" ASA

Table 1a: Properties of "TOYOLAC" ASA General Purpose

GENERAL PURPOSE GRADE 一般型											
Property 代表物性	Test Method 试验法	Test Condition 试验条件	Units 单位	Medium Impact 中抗冲击		High Impact 高抗冲击		High Flow 高流动		
			Type 型号	TA10	TA10	TA30	TA30	TA50	TA50	TA50C
			Suffix 区分字符	X01	X02	X01	X02	X01	X02	X50
ISO STANDARD										
Melt Flow Rate 流动系数	ISO 1133	220°C / 10 kg	g/10min	17	15	12	6	43	25	21
Charpy Impact Strength (notched) 缺口冲击强度	ISO 179/1eA	23°C / 50 %RH	kJ/m^2	16	11	20	22	8	10	10
Deflection Temperature Under Load 热变形温度	ISO 75	1.8 MPa / 120°C/hr	°C	80	83	78	80	80	80	82
Tensile Strength 引张强度;降伏点	ISO 527	50 mm/min	MPa	40	48	34	40	42	45	53
Tensile Elongation at Break 拉伸伸长率			%	>10	>10	>10	>10	>10	>10	> 10
Tensile Modulus 拉伸模数		1 mm/min	MPa	1900	2400	1600	1900	2000	2090	2500
Flexural Strength 弯曲强度	ISO 178	2 mm/min	MPa	60	72	50	62	64	65	83
Flexural Modulus 弯曲模数				1870	2200	1630	2000	2050	2030	2500
Glossiness 光泽度	Toray Method 东丽法	Incident Angle 60º	%	96	96	95	95	96	96	-
Density 比重	ISO 1183	23°C	kg/m^3	1060	1060	1060	1060	1060	1060	1060
Flammability 燃烧性	UL94 File No. E41797			HB	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 1b: Properties of "TOYOLAC" High Heat ASA

HIGH HEAT ASA 耐热型 ASA					
Property 代表物性	Test Method 试验法	Test Condition 试验条件	Units 单位	High Heat 耐热	
			Type 型号	TA42C	TA44
			Suffix 区分字符	X01	X50
ISO STANDARD					
Melt Flow Rate 流动系数	ISO 1133	220°C / 10 kg	g/10min	20	6
Charpy Impact Strength (notched) 缺口冲击强度	ISO 179/1eA	23°C / 50 %RH	kJ/m^2	10	11
Deflection Temperature Under Load 热变形温度	ISO 75	1.8 MPa / 120°C/hr	°C	85	90
Tensile Strength 引张强度;降伏点	ISO 527	50 mm/min	MPa	45	50
Tensile Elongation at Break 拉伸伸长率			%	>5	>5
Tensile Modulus 拉伸模数		1 mm/min	MPa	2200	2385
Flexural Strength 弯曲强度	ISO 178	2 mm/min	MPa	70	76
Flexural Modulus 弯曲模数				2180	2350
Glossiness 光泽度	Toray Method 东丽法	Incident Angle 60°	%	-	87
Density 比重	ISO 1183	23°C	kg/m^3	1067	1089
Flammability 燃烧性	UL94 File No. E41797			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」

3.0 Molding (Injection)

3.1 Drying and Molding Temperature Conditions

Molding Process Condition			
Predrying Condition	Drying Temperature	°C	80 - 85
	Drying Time	Hr	3 - 5
Molding Condition	Molding Temperature	°C	190 - 230
	Injection Molding	MPa	70 - 140
	Mold Temperature	°C	30 - 60

* The molding temperature varies according to the mold material (thin tray) and special molding techniques and not limit to the above temperature.
* Please keep the temperature below 230°C to keep the resin performance.

3.2 Injection Speed & Pressure

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

Injection pressure should be controlled to mold full parts consistently with acceptable appearance. Many parameters affects the 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” ASA General Purpose Grades. It is important that the injection pressure should drop off to holding pressure after fill-up immediately

3.3 Mold Temperature

The mold temperature affects the surface quality and level of residual stress in the molded products. To provide a molded products having excellent surface finished and less residual stress, the mold temperature should be control ranging between 30 - 60°C. Higher mold temperature may cause longer cycle time and warpage problem.

3.4 Purging

General maintenance and equipment cleaning should include frequent purging with natural ASA 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 ASA resin or AS resin. Continue this operation until hopper is empty throughout and confirm barrel temperature has been dropped less than 150°C.

4.0 Weathering test

ASA weathering performance was tested by using Sunshine Weather Meter for 2000 hours. Below shows the testing conditions:

Chamber Temperature	: 42 °C
Black Panel Temperature	: 63 °C
Humidity	: 50 %
Rain Cycle	: 12 min / 102min
Filter	: 400nm

The ASA weathering ability is shown in figures below comparing with ABS:

Figure 1: TOYOLAC$_{TM}$ TA10 X01 Glossiness after Weathering Test

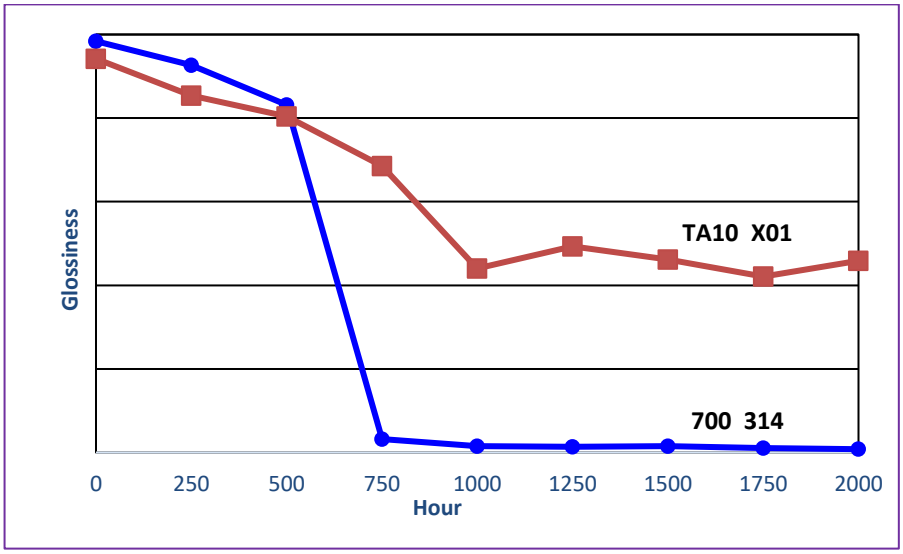


Figure 2: TOYOLAC$_{TM}$ TA10 X01 YI after Weathering Test

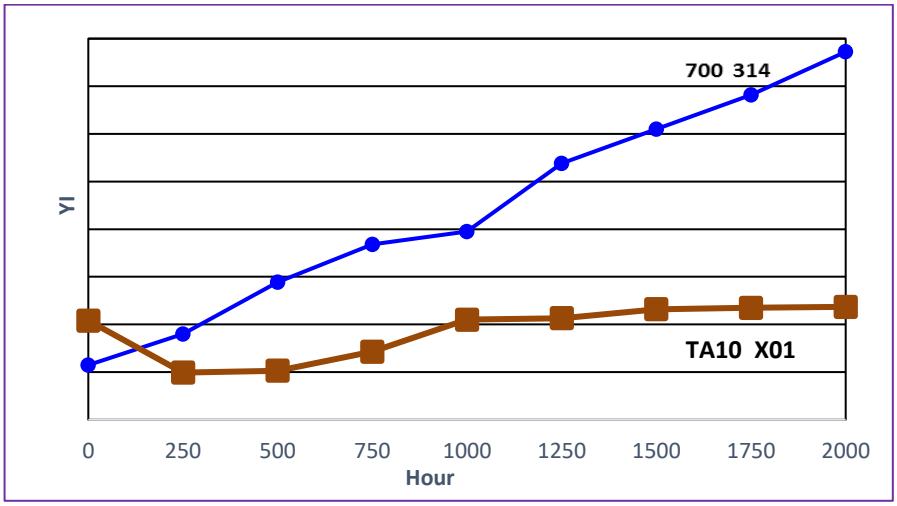
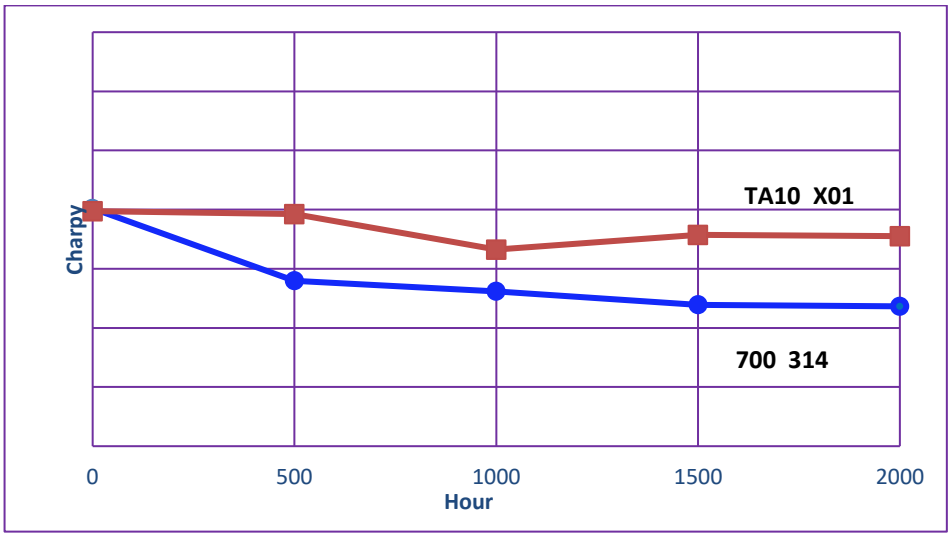


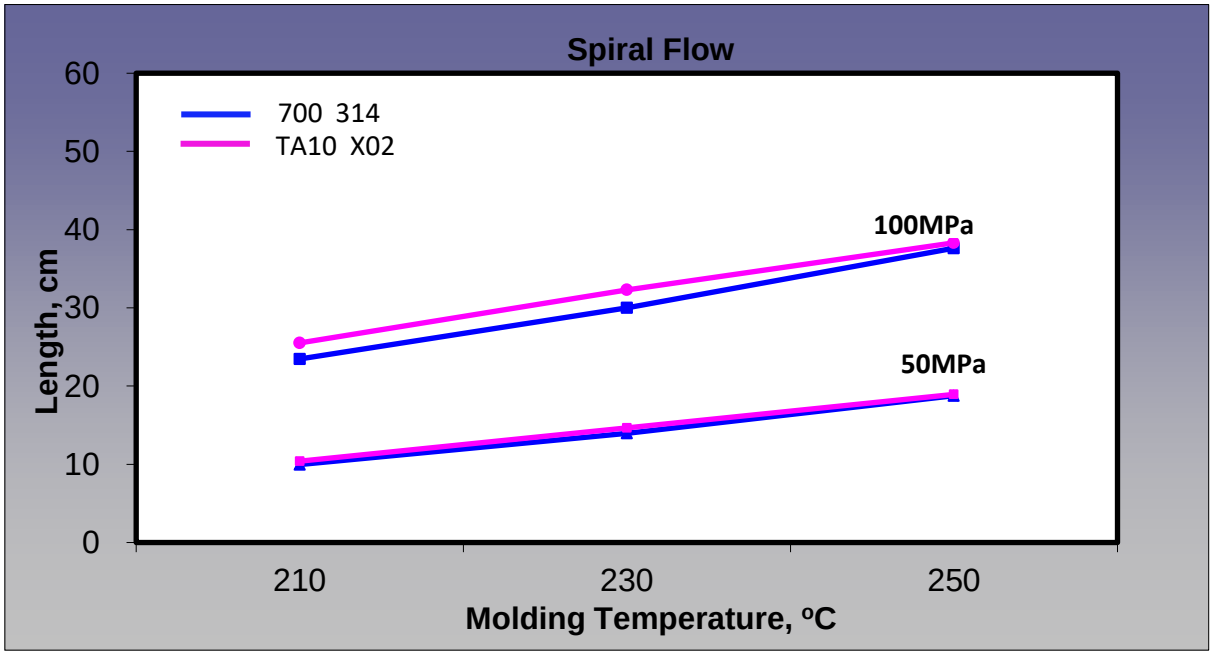
Figure 3: TOYOLAC$_{TM}$ TA10 X01 Charpy after Weathering Test



5.0 Flow Ability (Spiral Flow Length)

The flow ability (Spiral Flow Length) of "TOYOLAC" ASA is shown in **Figure 4**.

Figure 4 : TOYOLAC$_{TM}$ TA10 X02 flow ability (Spiral Flow Length)



Spiral Flow Molding Condition

Injection Molding Machine	: Toshiba IS80-FPA
Molding	: 210°C , 230°C , 250°C
Mold Temperature	: 60°C
Injection Pressure	: 50MPa, 100MPa
Mold Dimension	: 5w x 2mmt spiral
Measure Method	: Measure test piece after 24 hours conditioning 23°C,50% Rh

6.0 Troubleshooting

Typical molding problems and solutions are shown as the 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.

Table 2: Checklist of Troubleshooting of "TOYOLAC" ASA General Purpose Grades

Problems / Problem Solution Checklist	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 Qty	●		●						●			
Decrease Filling Qty		●										
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											●	

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.