

# KUMHO SAN Overview

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Kumho Petrochemical | Research & Business Development Center

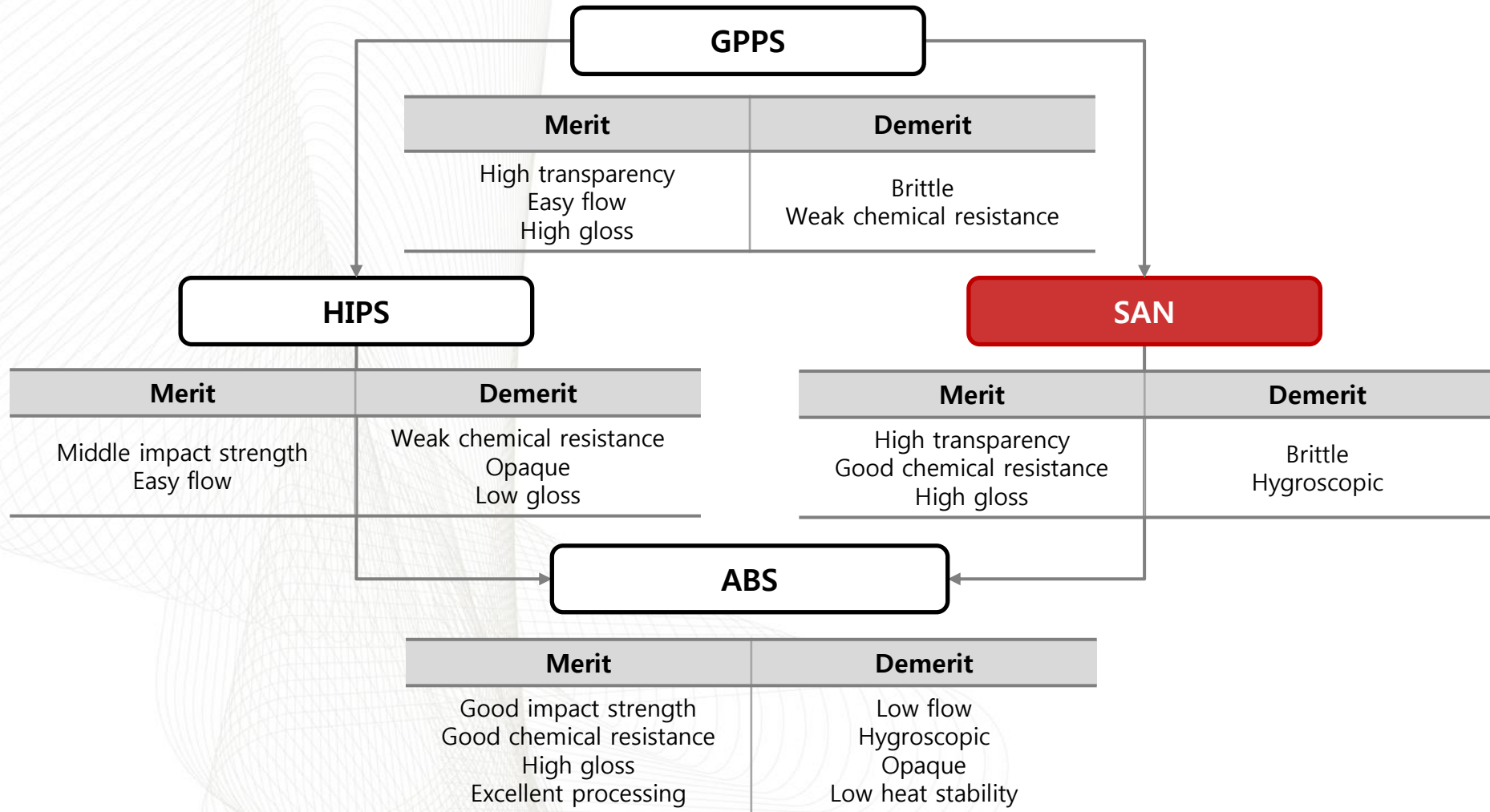
**I. General Features of KUMHO Resin**

**II. KUMHO SAN Products**

**III. Food Contact Materials**

# I . General Features

## Styrenic Polymers



## II. KUMHO SAN Products – General Properties

Application	GRADE	AN (%)	Mw (x10 <sup>4</sup> )	MI (230°C, 3.8Kgf)	MI (220°C, 10Kgf)	MI (200°C, 5.0Kgf)
Injection molding and Extrusion (Blue tint & Ice)	SAN 310CTR	20.5	15.0	20	66	6.6
	SAN 310TR	21.0	17.5	11	31	3.1
	SAN 330 I	24.5	17.0	8.3	22.7	2.3
	SAN 335T	26.0	15.5	10	25	2.5
Disposable lighter	SAN 350HW	34.0	15.5	6	15	1.5
Compounding (ABS, EP)	SAN 320A	24.5	10.4	39	110	11
	SAN 326A	26.0	12.6	21	63	6.1
	SAN 300A	28.0	12.5	21	60	6.1
	SAN 300H	28.0	18.0	3.8	9.5	1
	SAN 350A	32.0	11.4	12	30	3
	SAN 350HM	33.0	15.5	5.5	12.1	1.2

\*These are just typical properties, and do not mean specifications. Users should check by their own test.

## II. KUMHO SAN Products – Typical application

Compounding



Cosmetic case



Food Container



KUMHO  
SAN

Home appliances



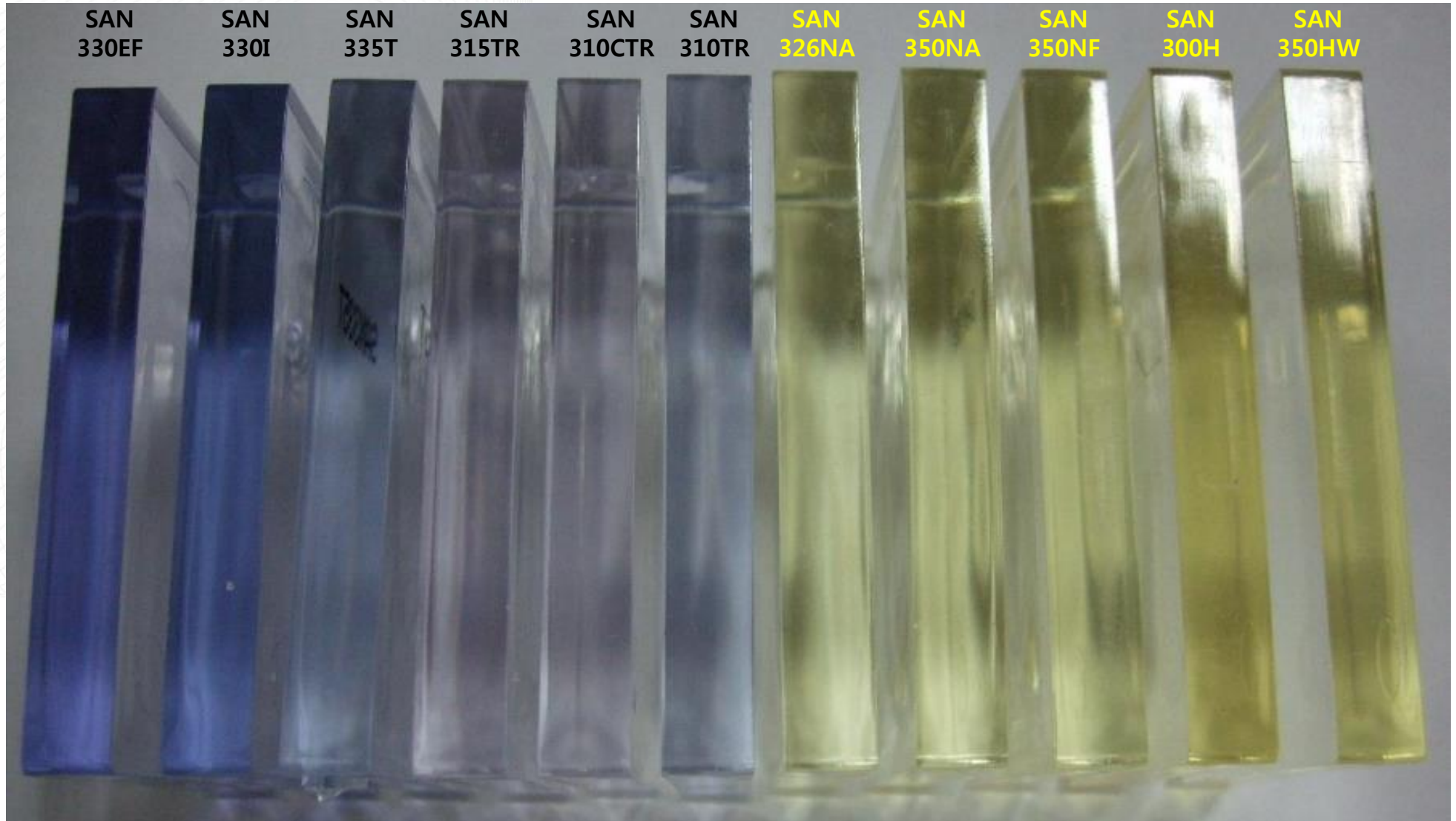
Green House



Shower Booth



## II. KUMHO SAN Products – Color Variants



### III. Food Contact Materials – SAN

## Major Regulations

	EU	US	Korea	China	Japan
<b>Definition</b>	FCM (Food Contact Material)	FCN (Food Contact Substance)	Utensils, container and packaging	FCPM (Food container and packaging materials)	Utensils, container and packaging
<b>Regulation</b>	EU 10/2011	FDA 21 CFR	NIFDS	GB9685	JHOSPA
<b>Positive List</b>	○ (Union List)	○	X	○	(○) Self restriction
<b>Negative List</b>	X	○	X	X	(○) Self restriction
<b>TEST</b>	SML, OML	CEDI, ADI	Migration test	SML	EDI, ADI

<Notes>

- Positive List: Authorized substances List
- Negative List: Restricted substances List
- SML: Specific Migration Limit
- OML: Overall Migration Limit
- EDI, CEDI: Cumulative Estimated Daily Intake
- ADI: Acceptable Daily Intake

EU applies a **single unified regulation** to plastic materials and articles intended to come into contact with food. Each member country of EU recognizes **the Union List on plastic raw materials, based on the regulation EU 10/2011.**

### III. Food Contact Materials – SAN

## EU Requirements

Regulation	Union List (Positive List)	TEST	components	Limits	KUMHO SAN
EU 10/2011 <sup>1)</sup>	<ul style="list-style-type: none"> <li>Monomers and starting substances</li> <li>Additives and polymer production aids</li> </ul>	Overall test (OML)	All substances	< 60mg/kg (10mg/dm <sup>2</sup> )	PASS
		Specific test (SML)	Styrene	< 60mg/kg	PASS
	<b>Acrylonitrile</b>		<b>&lt; 0.01mg/kg</b>	<b>PASS</b>	
	<ul style="list-style-type: none"> <li>General restriction on materials &amp; Articles</li> </ul>	Specific test (SML)	Heavy metals (Ba, Co, Cu, Fe, Li, Mg, Zn, Al)	*Dependent on metals	PASS
			Primary aromatic amines	< 0.01mg/kg	PASS

1) (EU) No. 10/2011: Regulation on Plastic materials and articles intended to come into contact with food

**The Most Critical Requirement!**

- **Test condition & Simulant are specified by client with the worst foreseeable conditions of actual use.**
- **NIAS (Non-intentionally added substances) Test: Risk assessment of NIAS → *Optional***
- **KUMHO SAN products as food contact material comply with relevant regulations in the EU.**
- **KUMHO SAN products are met the requirement of AN specific migration test in severe conditions. (Simulant: 3% acetic acid, Test condition: 10d at 40°C)**



### III. Food Contact Materials – SAN

#### ANNEX III. Food simulants

Abbreviations	Food Simulants	Food type
A	10% Ethanol	Food with hydrophilic character
<b>B</b>	<b>3% Acetic Acid</b>	<b>Foods that have a hydrophilic character and able to extract hydrophilic substances and which have a pH below 4.5</b>
C	20% Ethanol	Food up to 20% alcoholic content
D1	50% Ethanol	Food up to 20% alcoholic food and dairy products
D2	Vegetable Oil	Food have lipophilic character, free fats
E	Poly(2,6-diphenyl-p-phenylene oxide)	Dry foods

#### ANNEX V. Test condition

Contact time	Test time
$t \leq 5\text{min}$	5min
$5\text{min} < t \leq 0.5\text{h}$	0.5h
$1\text{h} < t \leq 1\text{h}$	1h
$2\text{h} < t \leq 6\text{h}$	6h
$6\text{h} < t \leq 24\text{h}$	24h
$1\text{d} < t \leq 3\text{d}$	3d
<b><math>3\text{d} &lt; t \leq 30\text{d}</math></b>	<b>10d</b>

Contact temperature (°C)	Test temperature (°C)
$T \leq 5$	5
$5 < T \leq 20$	20
<b><math>20 &lt; T \leq 40</math></b>	<b>40</b>
$40 < T \leq 70$	70
$70 < T \leq 100$	100

- **10d at 40°C** : Any long term storage at room temperature or below, including heating up to 70°C for up to 2 hours, for heating up to 100°C for up to 15minutes.

### III. Food Contact Materials – SAN

## LFGB requirements

- LFGB<sup>1)</sup> TEST: German Food, Articles of Daily Use and Feed Code of September 1, 2005 (LFGB), Section 30 and 31,

#### 1. Plastic test

Test Item	Permissible Limit	Note
Lead and Cadmium	N.D	
<b>Volatile Organic Matter (VOM)</b>	<b>15 mg/dm<sup>2</sup></b>	<b>According to BfR Recommendation V (SAN)</b>
Peroxide Value	N.D	

→ **Mandatory**

In compliance with [LFGB Section 30](#), [EU Regulation \(EU\) No 10/2011](#) and BfR recommendation

#### 2. Sensorial examination of odour and taste → **Mandatory**

Test Simulant	Test Item	Permissible Limit <sup>1)</sup>
Water	Sensorial examination odour	2.5
	Sensorial examination taste	2.5

1) Intensity scale: 0 to 4, 0 – no perceptible difference, 2 – slight difference, 4 – strong difference

In compliance with [LFGB Section 30, 31](#) and [EU Regulation \(EC\) No 1935/2004](#).

1) LFGB: Lebensmittel-und Futtermittelgesetzbuch, German Food Commodity and Feed Law

### III. Food contact material – SAN

## SAN grades for Food Contact materials

Grade	EC 1907/2006	EC 1935/2004		EC 2023/2006	EU Directive		
	REACH Compliance	EU 10/2011	LFGB*	GMP (Good manufacturing Practice)	2011/65/EC (RoHS)	94/62/EC (Package and packaging waste)	2009/48/EC (Toy safety EN 71-3)
		AN-migration					
<b>SAN 310CTR</b>	●	●	●	●	●	●	●
SAN 310TR	●	▲	●	●	●	●	●
SAN 330I	●	▲	●	●	●	●	●
SAN 335T	●	▲	●	●	●	●	●
<b>SAN 310TR E</b>	●	●	●	●	●	●	●
<b>SAN 330I E</b>	●	●	●	●	●	●	●
<b>SAN 335T E</b>	●	●	●	●	●	●	●

\* LFGB: In compliance with LFGB Section 30, 31 except AN-migration test.

**KUMHO has developed *NEW SAN E grades* for food contact materials.**