

# SUNJIN Beauty Science. Industrial Micro Beads

SINCE 1978

## Preface

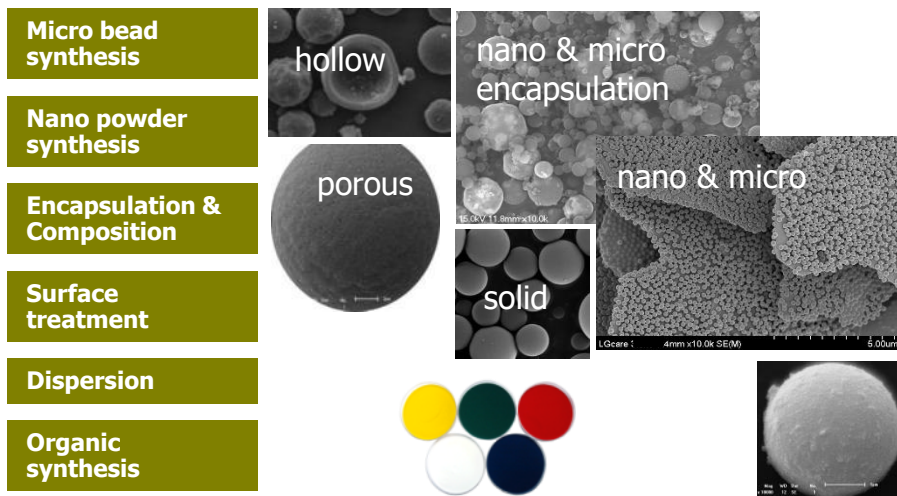
- 2 SUNJIN members
- 3 COMPANY overview
- 4 Technology & Product overview
- 7 LD(X) vs. MD(X) vs. MAX vs. SAX  
Poly-dispersed  
Moderately Mono-dispersed  
Mono-dispersed
- 14 Particle Size Analyzers' Resolution comparison



## Products Overview

- 6 **HISOFT Series :**  
**The Softest** polymer beads  
For film back coating  
軟質微球体(연질비드)
- 8 **LD Series :**  
Poly Dispersed PMMA beads  
**Good Solvent resistance**  
多分散 (다분산)
- 10 **LDX Series :**  
Poly Dispersed PMMA beads  
**Excellent Solvent resistance**  
多分散, 高耐溶劑性(다분산)
- 19 **MD Series :**  
Moderately Mono-dispersed PMMA beads  
中分散 (중분산)
- 21 **MDX Series :**  
Moderately Mono-dispersed PMMA beads  
中分散, 高耐溶劑性(중분산)
- 25 **MAX Series :**  
Mono-dispersed PMMA beads  
單分散(단분산)
- 27 **SAX Series :**  
Mono-dispersed PS beads  
單分散(단분산)
- 29 **HR Series :**  
High Refractive Index  
PS Bead  
高屈折(고굴절) RI 1.56 ~ 1.59
- 30 **LR Series :**  
Low Refractive Index  
Polymer Bead  
低屈折(저굴절) RI 1.43
- 31 **HLDP Series :**  
The Highest **Heat Resistant** PMMA Beads for LED Lighting  
高耐熱性(고내열성)
- 34 **SUNPMMA-S Series :**  
standard paint & coating additive  
塗料用(도료용)
- 35 **Small Size Color PMMA beads**  
for Optics / Paint & Coating
- 36 **SUNPAN Series :**  
**AcryloNitrile** beads  
for Leather feel texture  
塗料用(도료용)
- 38 **SUNSIL Series :**  
Silica beads  
For Hard coating  
消光劑(소광제, 경도향상)
- 39 **Large Size Color PMMA beads**  
for the Visual effect of plastic
- 40 **UC series :**  
Low Molecular Weight Acryl beads  
低分子量(저분자량)

## TECHNOLOGY OVERVIEW



## COMPANY OVERVIEW

- Founded in 1978
- Headquartered in Korea
- Product Category:
  - ⇒ Cosmetic Raw Materials,
  - ⇒ Surfactants,
  - ⇒ Paint & Coating Raw Materials,
  - ⇒ Plastic,
  - ⇒ Optical Materials
- ISO 9001 certified

## SUNJIN brings new concepts & new technologies from other industries

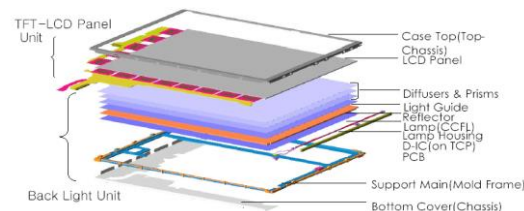
### Cosmetic Raw Material



### Paint & coating



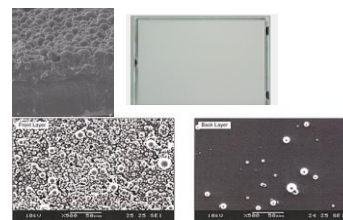
### Flat Panel Display: LCD, PDP



### Surfactants for Personal Care



### Plastic



## Technology

### **Polymer Composition Control**

By suspension polymerization

## Property

Solvent Resistance Control  
High / Low

High Heat Resistance

Refractive Index Control  
High RI / Low RI

### **Particle Size Control**

by suspension polymerization

Narrow Particle Size  
Distribution by Classification

## Products / Main application

MD & MDX series (Moderately Mono Dispersed)  
LD & LDX series (Poly-dispersed)

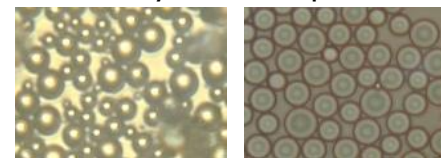
for Light Diffusion Film



HLDP series  
for the PC resin Molding of LED Lamp



HR(1.59) series for High Haze  
LR(1.43) series for High brightness



MDX series for High brightness  
Moderately Mono Dispersed with CV < 25

## Technology

## Property

## Products / Main application

### **Seeded Polymerization**

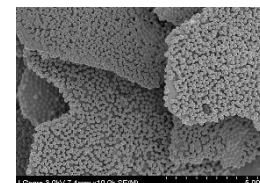
Mono-dispersed Micro Beads

MAX series for High brightness



### **Emulsion Polymerization**

Sub Micron Size Polymer Bead



### **Polymer Surface Treatment**

Hydrophobic, Hydrophilic  
Surface Treatment

Improved compatibility with  
binders, solvents

### **Encapsulation Technology**

Color Beads



For paint & coating,  
optical films, plastics

### **Other Polymer Beads**

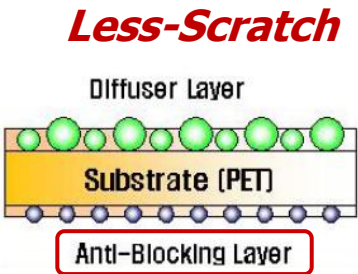
Acrylonitrile Bead, Urethane,  
Urethane Acrylate Bead

Acryl beads  
Poly-dispersed  
Yellow Index: 4.5 Max

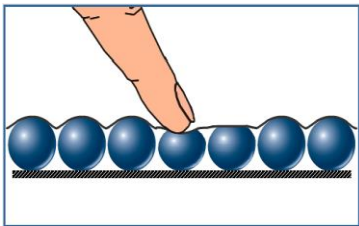
Grade	Descriptions	Particle Size (μm)	
		D50	D100
HISOFT-50H	Most Soft	5.0±1.0	18
HISOFT-80H	Most Soft	7.5±1.5	20
HISOFT-50	Soft	5.0±1.0	18
HISOFT-80	Soft	7.5±1.5	20

Best recommend for

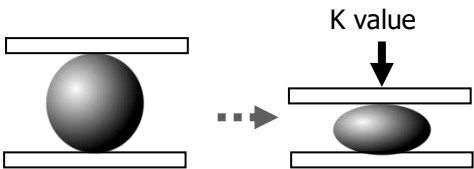
(1) Back Coating of Light Diffusion Film



2) Smooth feel texture of Paint & Coating



**K value:** Measurement of Softness

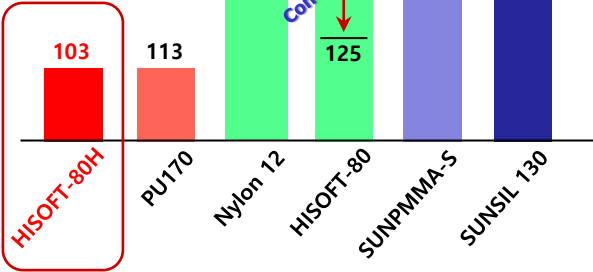


$K = (3/2^{1/2})(F)(S^{-3/2})(R^{-1/2})$   
S: Sample displacement  
R: Sample radius

One particle of each powder type was exposed to compression.  
Pressure necessary for 10% deformation of the particle was measured.  
(Measuring Tool: Shimadzu Micro Compression Testing Machine MCTM-500)

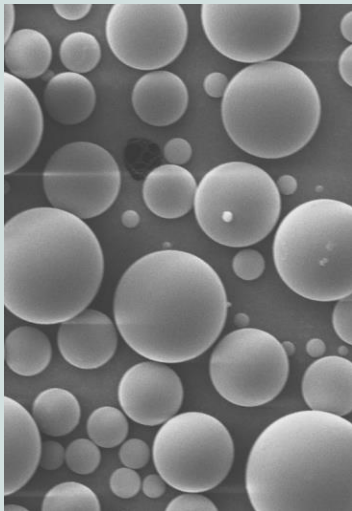
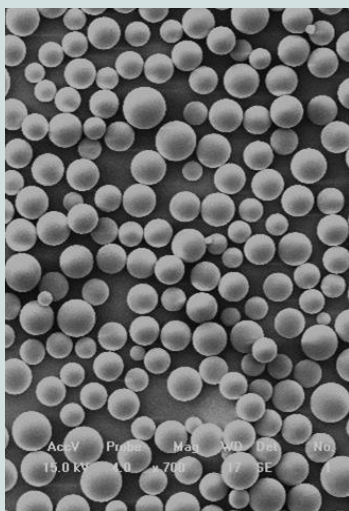
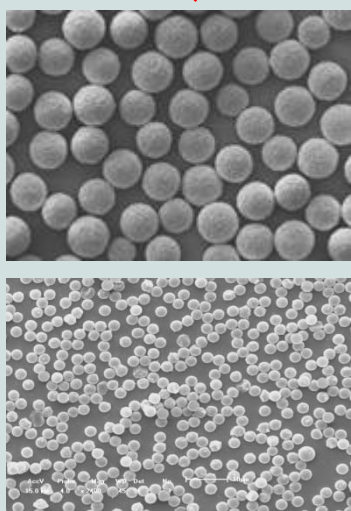


The lower K value, the softer



The lower K value, the softer polymer bead, the less abrasive  
軟性最優秀

# LD & LDX, MD & MDX, MAX & SAX series based on Particle Size Distribution

Grade D50	LD200 & LDX200 15um	MD150 & MDX150 15um	MAX150 & SAX80 15um & 8um
Particle size distribution	Poly-dispersed (多分散)	Moderately Mono-dispersed (中分散)	Mono-dispersed (單分散)
C.V (Coefficient of Variation)	40	< 25	< 15
Description	LD: Crosslinked LDX: Highly Crosslinked	MD: Crosslinked MDX: Highly Crosslinked	MAX: PMMA SAX: PS
SEM Picture			

**C.V**

$$= \frac{SD * 100\%}{X}$$

The coefficient of variation, CV, is the standard deviation divided by the mean. It relates the breadth of the particle size distribution (in percentage) to the mean about which it is measured. The CV's utility is in measuring relative variation as opposed to absolute variation.



# LDX series : Poly-dispersed, The Highest Solvent Resistant PMMA Beads

多分散

Most highly Cross-linked  
PMMA bead  
Poly-dispersed  
Refractive Index: 1.49  
Yellow Index: 3.0 Max

Grade	Descriptions	Particle Size ( $\mu\text{m}$ )	
		D50	D100
LDX30	PMMA bead	2.5 ~ 4.5 $\mu\text{m}$	15.00 $\mu\text{m}$
LDX 50	PMMA bead	4 ~ 8 $\mu\text{m}$	22.00 $\mu\text{m}$
LDX 80	PMMA bead	5 ~ 7 $\mu\text{m}$	25.00 $\mu\text{m}$
LDX 120	PMMA bead	9 ~ 11 $\mu\text{m}$	31.00 $\mu\text{m}$
LDX 150	PMMA bead	11 ~ 14 $\mu\text{m}$	40.00 $\mu\text{m}$
LDX 200	PMMA bead	14 ~ 17 $\mu\text{m}$	46.00 $\mu\text{m}$
LDX 220	PMMA bead	22 ~ 24 $\mu\text{m}$	60.00 $\mu\text{m}$

The Highest Solvent Resistance to various solvents such as

- Toluene,
- Cyclohexanone,
- **MEK,**
- **Ethyl Acetate,**
- **Butyl Acetate,**

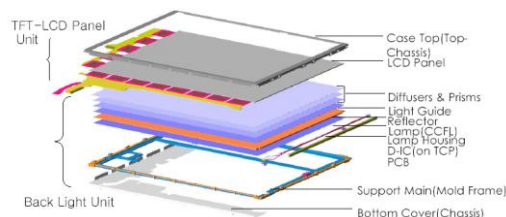
## Overize Cuts

Grade	Descriptions	Particle Size ( $\mu\text{m}$ )	
		D50	D100
LDX30C	PMMA bead	2 ~ 4 $\mu\text{m}$	10.00 $\mu\text{m}$
LDX 50C	PMMA bead	4 ~ 8 $\mu\text{m}$	18.00 $\mu\text{m}$
LDX 120C	PMMA bead	9 ~ 11 $\mu\text{m}$	31.00 $\mu\text{m}$
LDX 200C	PMMA bead	13 ~ 16 $\mu\text{m}$	40.00 $\mu\text{m}$

## Best recommend for

### (1)Light Diffusion Film for LCD backlight

- LDX has especially strong solvent resistance to MEK, Ethyl Acetate, Butyl Acetate



### (2)Light Diffusion coating for other films

- Projection Screen Sheet
- Window Film
- Protection Film



PMMA粉体的耐溶剂性优秀

折射率: 1.49  
黄度: 3.0 max

在多种溶剂中的耐受性优秀

- 甲苯,
- 环己酮,
- 甲乙酮,
- 醋酸乙酯,
- 醋酸丁酯,

## MEK

	LDX 80	LDX 200	S 80	MAX 100	MAX 200	HLDP 50	HISOFT 80
0 hr	6	5	26.4	35	39	11	5
2 hr	12	8	30.4	Too high to measure	Too high to measure	370	9
4 hr	30	27	Too high to measure			480	19
8 hr	42	38				630	36
12 hr	55	42				780	47
24 hr	64	51				890	55

## TOLUENE

	LDX 80	LDX 200	S 80	MAX 100	MAX 200	HLDP 50	HISOFT 80
0 hr	29	1.5	5.3	3.5	3.0	24.5	832
2 hr	32	1.5	10.3	75.2	17.4	25.5	840
4 hr	34	1.5	10.1	78.0	18.0	25.5	840
8 hr	35	1.5	11.9	81.0	18.0	26.0	842
12 hr	37	1.5	29.4	85.4	18.3	27.5	843
24 hr	38	6.5	40.2	92.1	29.2	34.6	1040



Test Method: 1. Powder:Solvent = 100g:100g 2. Measure viscosity 3. Brookfield spindle #1, 60rpm)



## ETHYL ACETATE

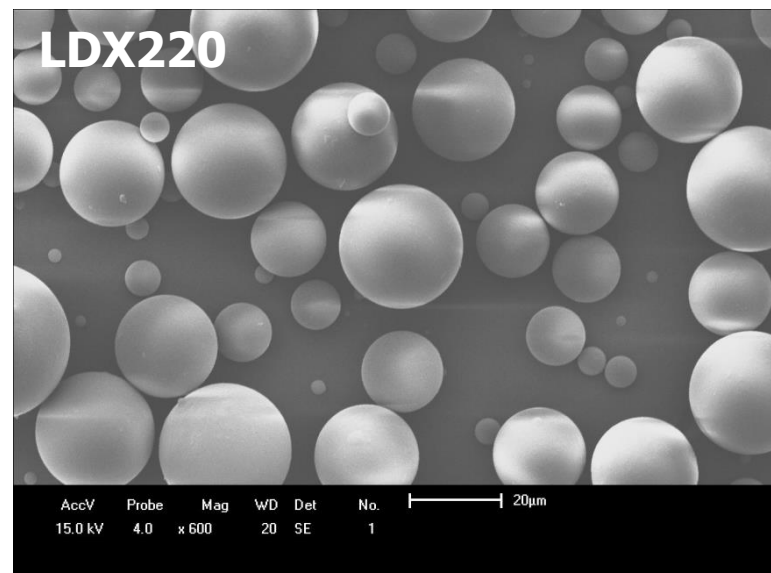
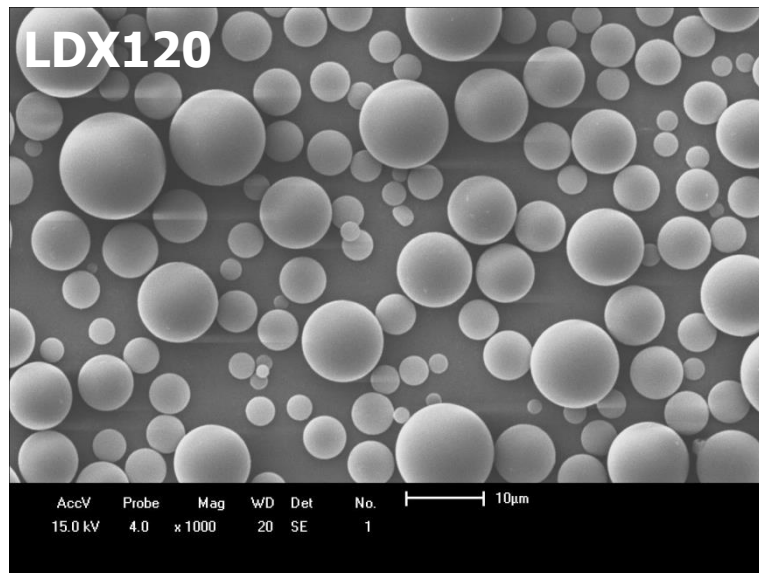
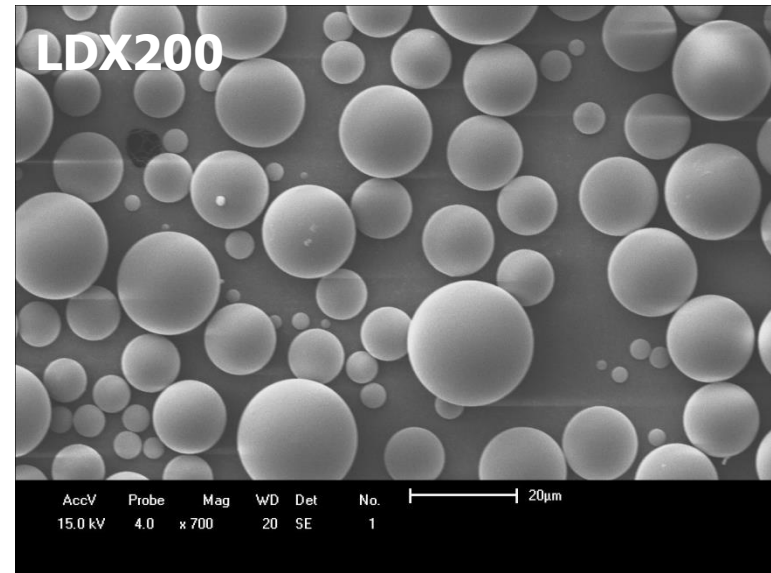
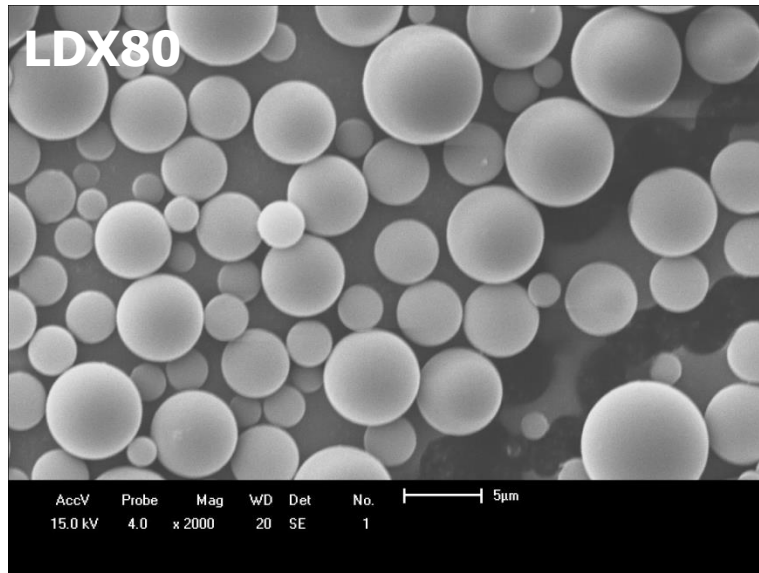
	LDX 80	LDX 200	S 80	MAX 100	MAX 200	HLDP 50	HISOFT 80
0 hr	21.5	7.9	34.2	66.2	48.6	22.0	234
2 hr	730	374	Too high to measure	Too high to measure	276	936	267
4 hr	800	423			784	Too high to measure	369
8 hr	820	519			1240		482
12 hr	864	615			Too high to measure		560
24 hr	2480	1162					704

## BUTYL ACETATE

	LDX 80	LDX 200	S 80	MAX 100	MAX 200	HLDP 50	HISOFT 80
0 hr	80.7	83	481.5	33.9	46	26.2	583
2 hr	258	167	513.4	228	143	34.7	820
4 hr	270	187	648	237	152	83	820
8 hr	274	193	882	312	163	126	823
12 hr	276	206	903	361	175	185	832
24 hr	285	293	932	380	275	273	936



Test Method: 1. Powder:Solvent = 100g:100g 2. Measure viscosity 3. Brookfield spindle #1, 60rpm)



# Particle Size Analyzers at SUNJIN

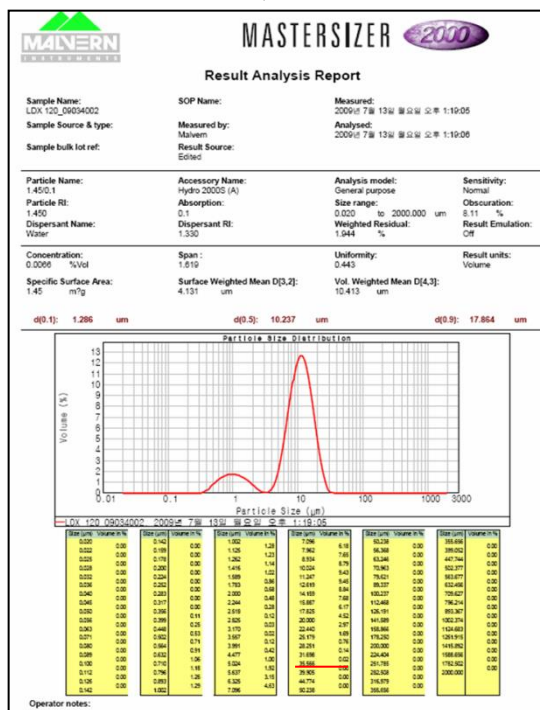
## 1. Tested the Sample

LDX120 Lot No. 09034002

## 2. At the Different Particle Size Analyzers

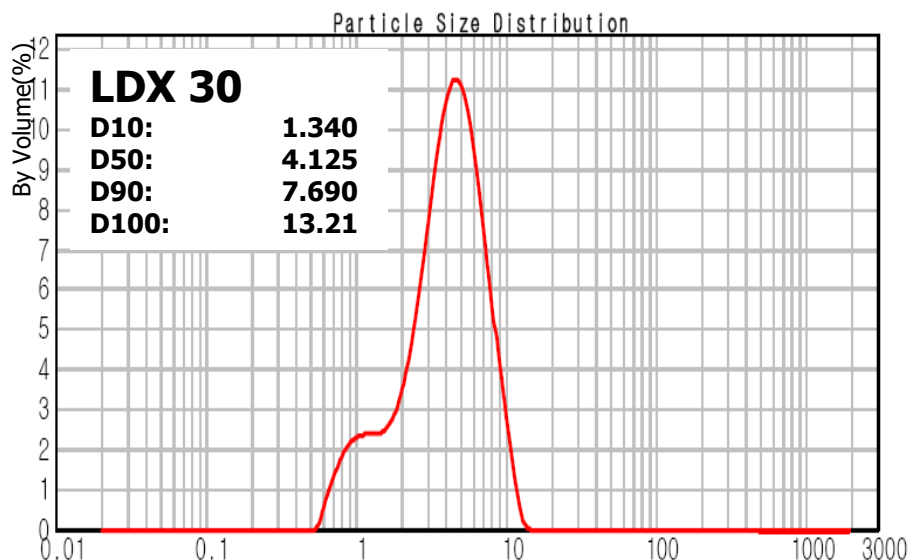
**MALVEN Mastersizer2000**

Laser Diffraction Method  
Installed at SUNJIN on July 2009



# LDX PARTICLE SIZE DISTRIBUTION

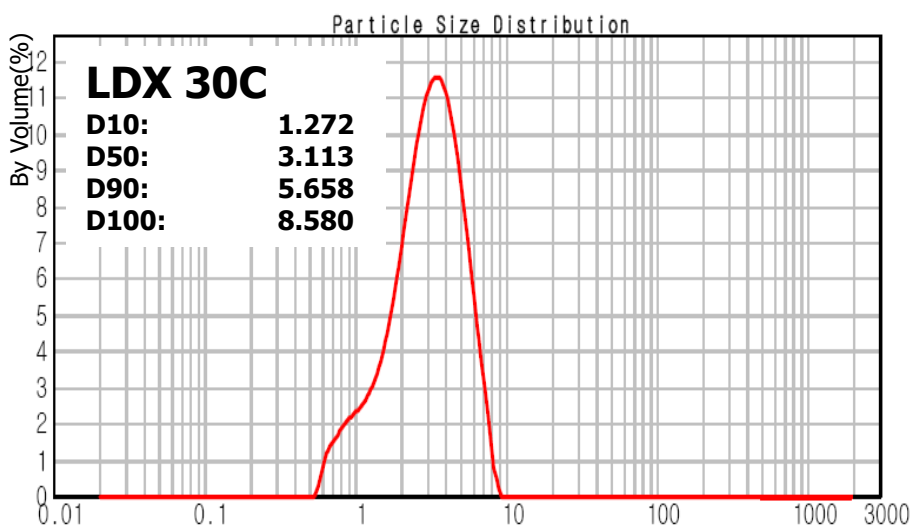
多分散



Size (μm)	Volume In %
0.010	0.00
0.017	0.00
0.020	0.00
0.023	0.00
0.030	0.00
0.035	0.00
0.040	0.00
0.046	0.00
0.052	0.00
0.060	0.00
0.069	0.00
0.079	0.00
0.091	0.00
0.105	0.00
0.120	0.00
0.138	0.00
0.158	0.00
0.182	0.00

Size (μm)	Volume In %
0.182	0.00
0.209	0.00
0.240	0.00
0.275	0.00
0.316	0.00
0.363	0.00
0.417	0.00
0.479	0.00
0.550	0.34
0.631	1.02
0.724	1.54
0.832	1.91
0.955	2.09
1.096	2.14
1.259	2.14
1.445	2.23
1.660	2.53
1.905	

Size (μm)	Volume In %
1.905	3.15
2.188	4.14
2.512	5.49
2.884	7.06
3.311	8.58
3.802	9.71
4.365	10.14
5.012	9.73
5.754	8.56
6.607	6.92
7.586	5.06
8.710	3.29
10.000	1.76
11.482	0.46
13.183	0.01
15.136	0.00
17.378	0.00
19.953	0.00



Size (μm)	Volume In %
0.010	0.00
0.017	0.00
0.020	0.00
0.023	0.00
0.030	0.00
0.035	0.00
0.040	0.00
0.046	0.00
0.052	0.00
0.060	0.00
0.069	0.00
0.079	0.00
0.091	0.00
0.105	0.00
0.120	0.00
0.138	0.00
0.158	0.00
0.182	0.00

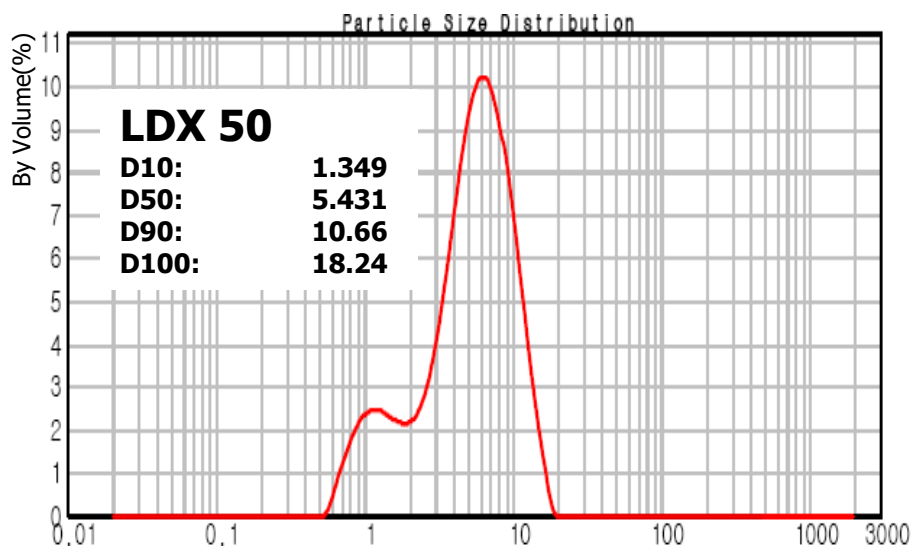
Size (μm)	Volume In %
0.182	0.00
0.209	0.00
0.240	0.00
0.275	0.00
0.316	0.00
0.363	0.00
0.417	0.00
0.479	0.00
0.550	0.53
0.631	1.22
0.724	1.58
0.832	1.89
0.955	2.12
1.096	2.42
1.259	2.90
1.445	3.68
1.660	4.83
1.905	

Size (μm)	Volume In %
1.905	6.27
2.188	7.82
2.512	9.21
2.884	10.16
3.311	10.44
3.802	9.95
4.365	8.73
5.012	7.02
5.754	5.01
6.607	3.09
7.586	1.14
8.710	0.00
10.000	0.00
11.482	0.00
13.183	0.00
15.136	0.00
17.378	0.00
19.953	0.00

Particle Size Analyzer : MALVEN Mastersizer2000

# LDX PARTICLE SIZE DISTRIBUTION

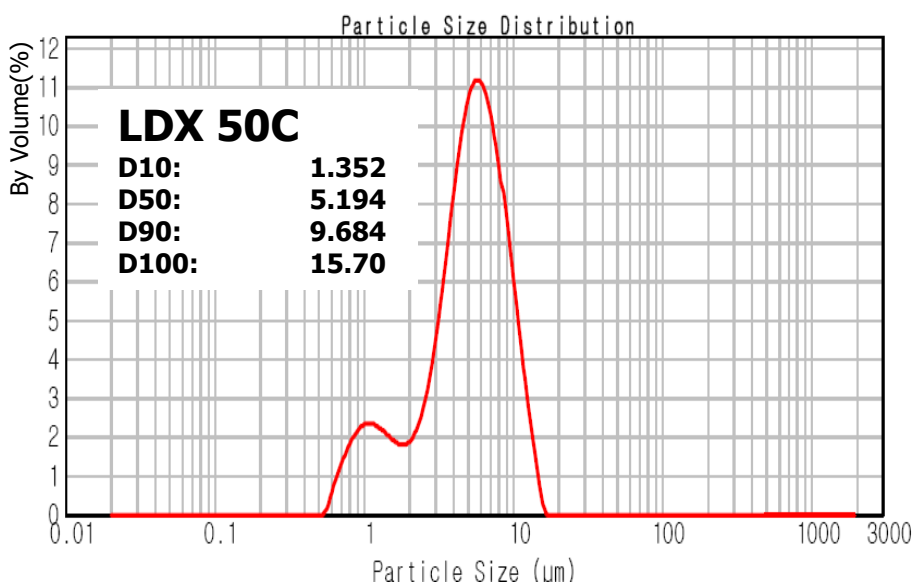
多分散



Size (μm)	Volume In %
0.020	0.00
0.100	0.00
0.252	0.00
0.317	0.00
0.356	0.00
0.399	0.00
0.448	0.00
0.502	0.29
0.632	0.73
0.710	1.12
0.796	1.45
0.893	1.69
1.002	1.82
1.125	1.85
1.262	1.81
1.416	1.72
1.589	1.64
1.783	0.00

Size (μm)	Volume In %
1.783	1.61
2.000	1.68
2.244	1.89
2.518	2.29
2.825	2.91
3.170	3.71
3.557	4.68
3.991	5.67
4.477	6.59
5.024	7.27
5.637	7.64
6.325	7.65
7.096	7.31
7.962	6.65
8.934	5.74
10.024	4.64
11.247	3.25
12.500	0.00

Size (μm)	Volume In %
12.500	0.24
12.619	0.72
13.000	0.81
13.500	0.86
14.159	1.42
15.887	0.63
17.825	0.03
20.000	0.00
22.000	0.00
23.000	0.00
24.000	0.00
25.179	0.00
28.251	0.00
29.000	0.00
30.000	0.00
31.698	0.00
32.000	0.00
33.000	0.00



Size (μm)	Volume In %
0.020	0.00
0.100	0.00
0.252	0.00
0.317	0.00
0.356	0.00
0.399	0.00
0.448	0.00
0.502	0.36
0.632	0.82
0.710	1.18
0.796	1.49
0.893	1.68
1.002	1.76
1.125	1.73
1.262	1.62
1.416	1.48
1.589	1.37
1.783	0.00

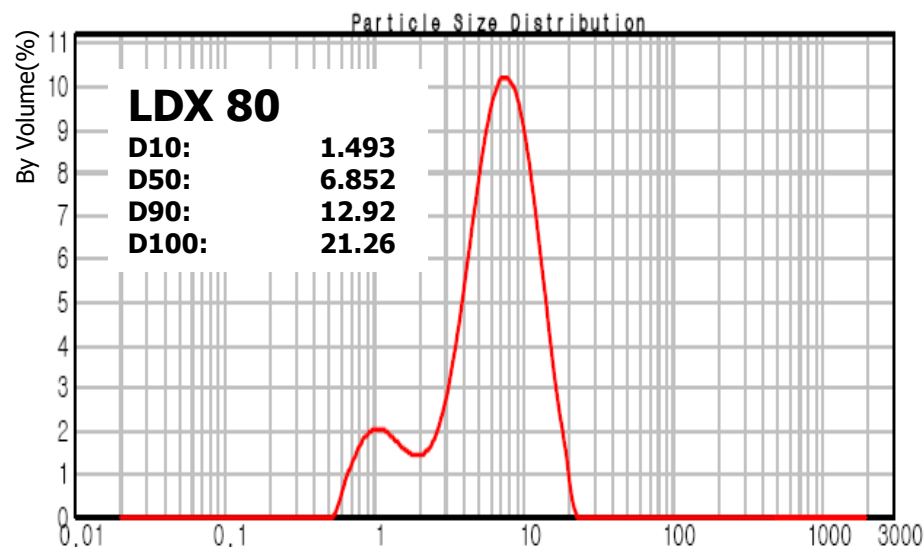
Size (μm)	Volume In %
1.783	1.35
2.000	1.47
2.244	1.78
2.518	2.35
2.825	3.19
3.170	4.26
3.557	5.48
3.991	6.66
4.477	7.64
5.024	8.25
5.637	8.41
6.325	8.11
7.096	7.41
7.962	6.39
8.934	5.18
10.024	3.87
11.247	2.45
12.500	0.00

Size (μm)	Volume In %
12.500	0.17
12.619	0.49
13.000	0.53
13.500	0.53
14.159	0.54
15.887	0.00
17.825	0.00
20.000	0.00
22.000	0.00
23.000	0.00
24.000	0.00
25.179	0.00
28.251	0.00
29.000	0.00
30.000	0.00
31.698	0.00
32.000	0.00
33.000	0.00

Particle Size Analyzer : MALVEN Mastersizer2000

# LDX PARTICLE SIZE DISTRIBUTION

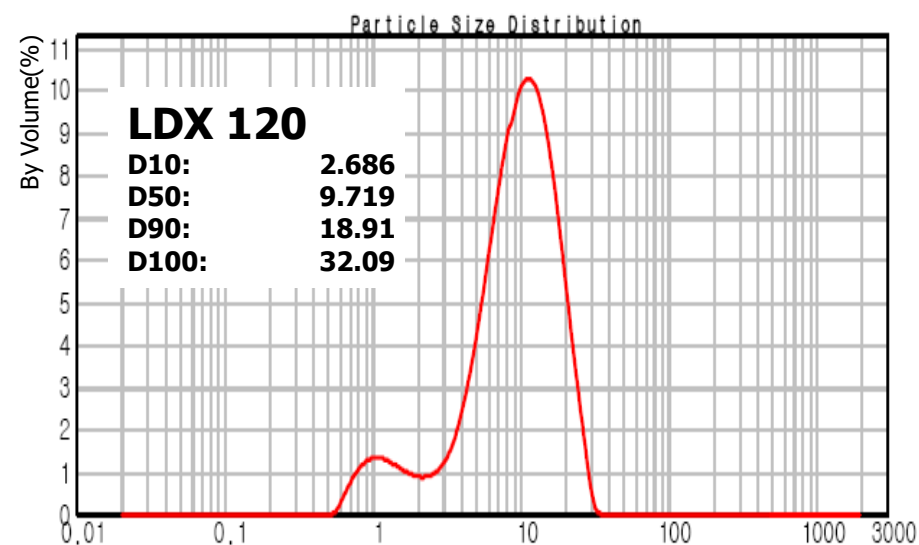
多分散



Size (μm)	Volume In %
0.020	0.00
0.100	0.00
0.252	0.00
0.317	0.00
0.356	0.00
0.399	0.00
0.448	0.00
0.502	0.35
0.632	0.76
0.710	1.07
0.796	1.34
0.893	1.49
1.002	1.53
1.125	1.49
1.262	1.38
1.416	1.25
1.589	1.13
1.783	1.06

Size (μm)	Volume In %
1.783	1.06
2.000	1.07
2.244	1.20
2.518	1.48
2.825	1.94
3.170	2.58
3.557	3.41
3.991	4.35
4.477	5.33
5.024	6.24
5.637	6.99
6.325	7.49
7.096	7.69
7.962	7.56
8.934	7.11
10.024	6.36
11.247	4.98
12.500	4.40

Size (μm)	Volume In %
12.500	0.40
12.619	1.21
13.000	1.43
13.500	1.63
14.159	3.12
15.887	2.06
17.825	1.26
20.000	0.26
22.000	0.00
23.000	0.00
24.000	0.00
25.179	0.00
28.251	0.00
29.000	0.00
30.000	0.00
31.698	0.00
32.000	0.00
33.000	0.00



Size (μm)	Volume In %
0.020	0.00
0.100	0.00
0.252	0.00
0.317	0.00
0.356	0.00
0.399	0.00
0.448	0.00
0.502	0.18
0.632	0.45
0.710	0.69
0.796	0.87
0.893	0.97
1.002	1.00
1.125	0.98
1.262	0.91
1.416	0.82
1.589	0.74
1.783	0.68

Size (μm)	Volume In %
1.783	0.68
2.000	0.65
2.244	0.66
2.518	0.72
2.825	0.87
3.170	1.12
3.557	1.50
3.991	2.02
4.477	2.70
5.024	3.49
5.637	4.36
6.325	5.26
7.096	6.11
7.962	6.85
8.934	7.40
10.024	7.71
11.247	7.09
12.500	6.63

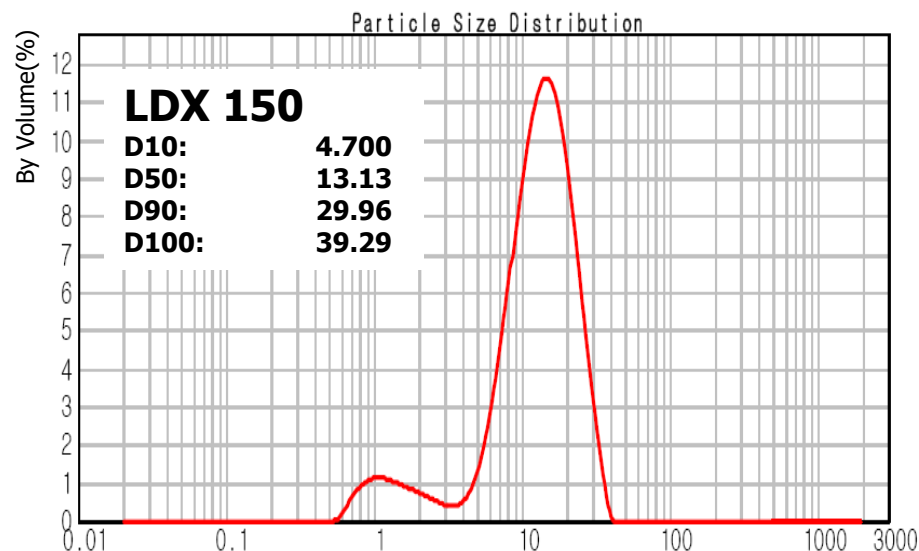
Size (μm)	Volume In %
12.500	0.63
12.619	1.95
13.000	2.44
13.500	3.00
14.159	6.74
15.887	5.84
17.825	4.73
20.000	3.04
22.000	1.15
23.000	0.94
24.000	0.89
25.179	1.41
28.251	0.17
29.000	0.14
30.000	0.10
31.698	0.01
32.000	0.01
33.000	0.00

Particle Size Analyzer : MALVEN Mastersizer2000



# LDX PARTICLE SIZE DISTRIBUTION

多分散

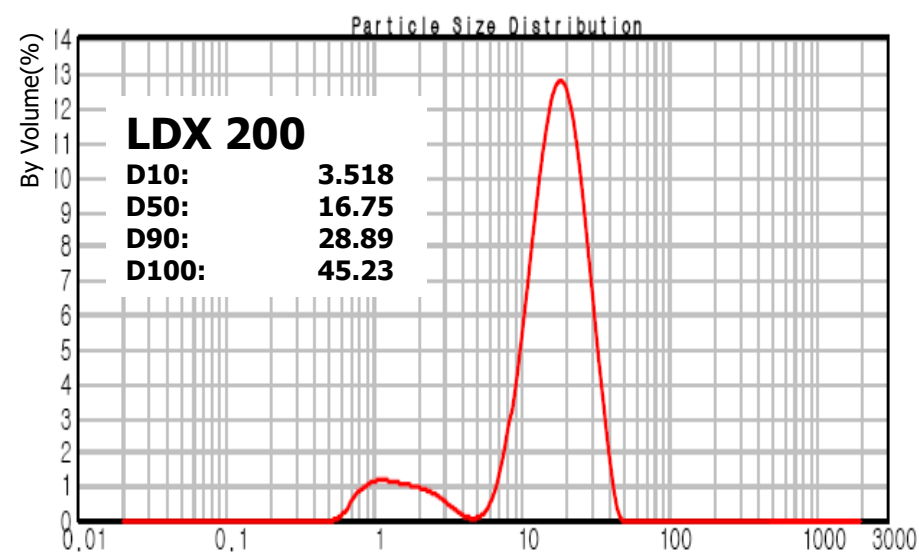


Size (μm)	Volume In %
0.200	0.00
0.224	0.00
0.252	0.00
0.283	0.00
0.317	0.00
0.356	0.00
0.399	0.00
0.448	0.00
0.502	0.00
0.564	0.12
0.632	0.36
0.710	0.58
0.796	0.73
0.893	0.80
1.000	0.87
1.125	0.83
1.262	0.78
1.416	0.00

Size (μm)	Volume In %
1.416	0.71
1.589	0.65
1.783	0.59
2.000	0.53
2.244	0.45
2.518	0.38
2.825	0.17
3.000	0.42
3.557	0.32
4.000	0.44
4.477	0.70
5.000	1.26
5.637	1.92
6.325	2.43
7.000	4.46
8.000	5.23
9.000	5.71
10.000	0.00

Size (μm)	Volume In %
10.000	5.96
11.000	8.93
12.500	8.49
14.000	10.14
16.000	4.48
17.000	4.06
18.000	3.65
19.000	3.26
20.000	5.45
22.000	2.25
23.000	1.95
24.000	1.69
25.000	1.46
26.000	1.25
27.000	1.07
28.000	1.68
30.000	0.65
31.000	0.00

Size (μm)	Volume In %
31.000	0.54
32.000	0.44
33.000	0.36
34.000	0.28
35.000	0.21
36.000	0.15
37.000	0.09
38.000	0.04
40.000	0.00
41.000	0.00
42.000	0.00
43.000	0.00
44.000	0.00
45.000	0.00
46.000	0.00
47.000	0.00
48.000	0.00
49.000	0.00



Size (μm)	Volume In %
0.020	0.00
0.100	0.00
0.252	0.00
0.317	0.00
0.356	0.00
0.399	0.00
0.448	0.00
0.502	0.12
0.632	0.28
0.710	0.57
0.796	0.70
0.893	0.82
1.002	0.87
1.125	0.87
1.262	0.85
1.416	0.81
1.589	0.77
1.783	0.00

Size (μm)	Volume In %
1.783	0.74
2.000	0.70
2.244	0.64
2.518	0.56
2.825	0.44
3.170	0.30
3.557	0.17
3.991	0.08
4.477	0.04
5.024	0.08
5.637	0.25
6.325	0.64
7.096	1.28
7.962	2.22
8.934	3.40
10.024	4.80
11.247	5.70
12.500	0.00

Size (μm)	Volume In %
12.500	0.57
12.619	1.85
13.000	2.48
13.500	3.33
14.159	8.79
15.887	9.49
17.825	9.63
20.000	7.65
22.000	3.37
23.000	3.07
24.000	3.25
25.179	6.74
28.251	1.30
29.000	1.55
30.000	2.22
31.698	0.35
32.000	1.03
33.000	0.00

Size (μm)	Volume In %
33.000	0.80
34.000	0.77
35.000	0.66
36.000	0.56
37.000	0.46
38.000	0.38
39.000	0.30
40.000	0.23
41.000	0.17
42.000	0.12
43.000	0.11
44.774	0.01
45.000	0.01
46.000	0.00
50.238	0.00
51.000	0.00
52.000	0.00
53.000	0.00

Particle Size Analyzer : MALVEN Mastersizer2000



# MDX series : Moderately Mono-Dispersed, The Highest Solvent Resistant PMMA Beads 中分散

Cross-linked PMMA bead  
Moderately Mono-dispersed  
Refractive Index: 1.49  
Yellow Index: 4.0 Max  
CV: <25

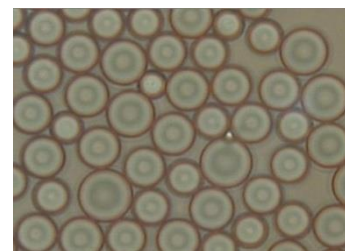
Grade	Descriptions		Particle Size ( $\mu\text{m}$ )	
	R.I	C.V	D50	D100
MDX50	1.49	25	4~7	15.65
MDX100	1.49	20	8~11	25.17
MDX150	1.49	20	13~17	35.56
MDX200	1.49	20	17~22	45.00

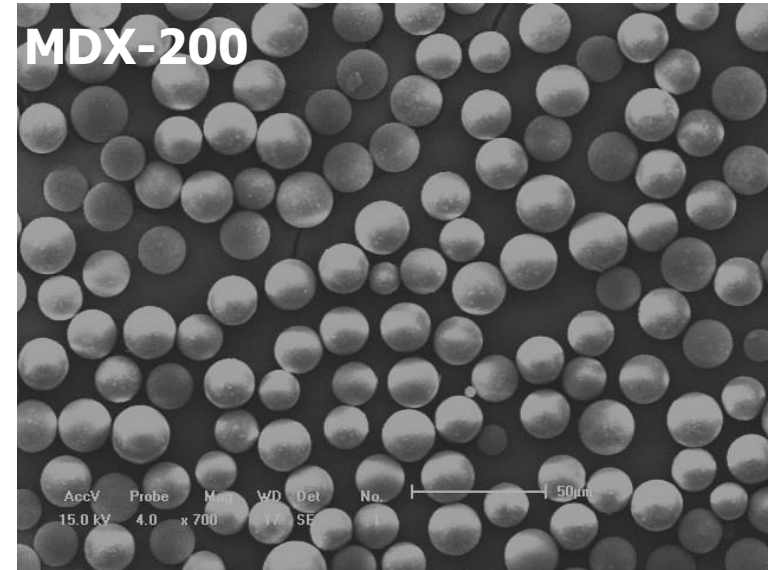
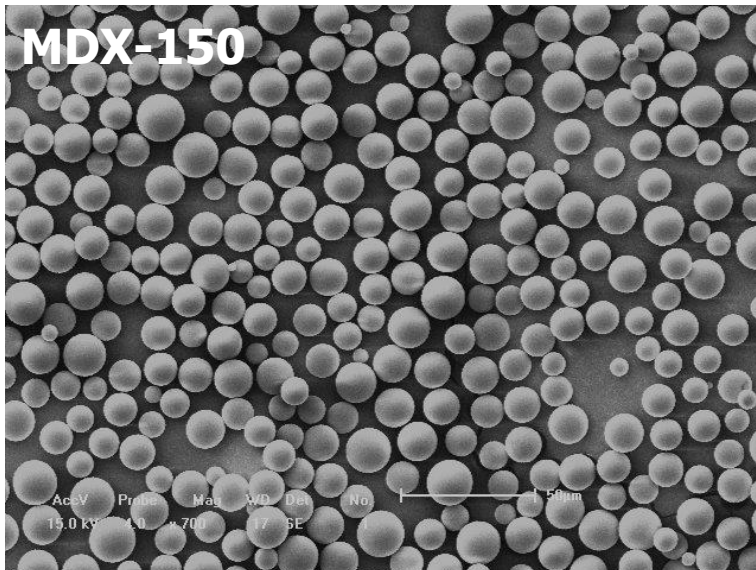
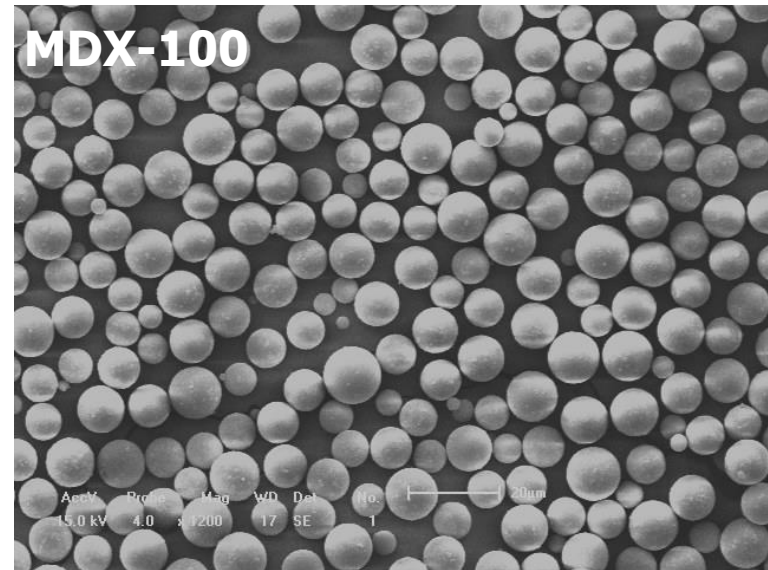
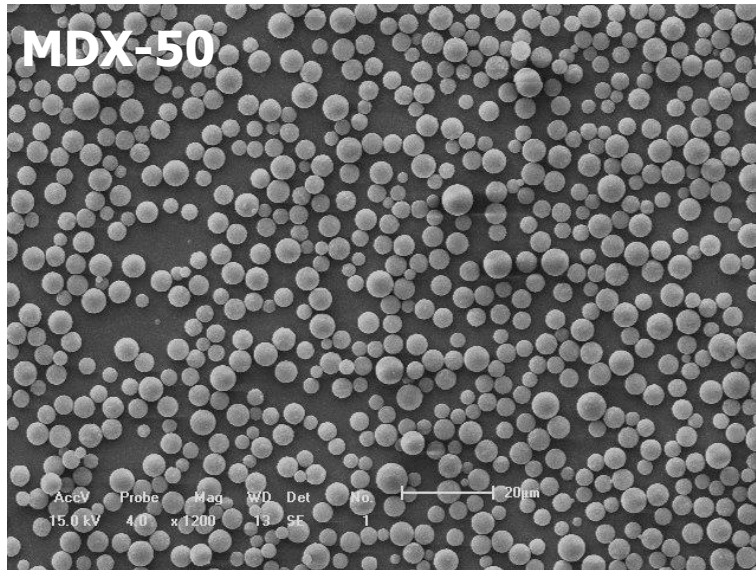
The Highest Solvent Resistance to various solvents such as

- Toluene,
- Cyclohexanone,
- **MEK,**
- **Ethyl Acetate,**
- **Butyl Acetate,**

## Best recommend for

(1) High Brightness Light Diffusion Film



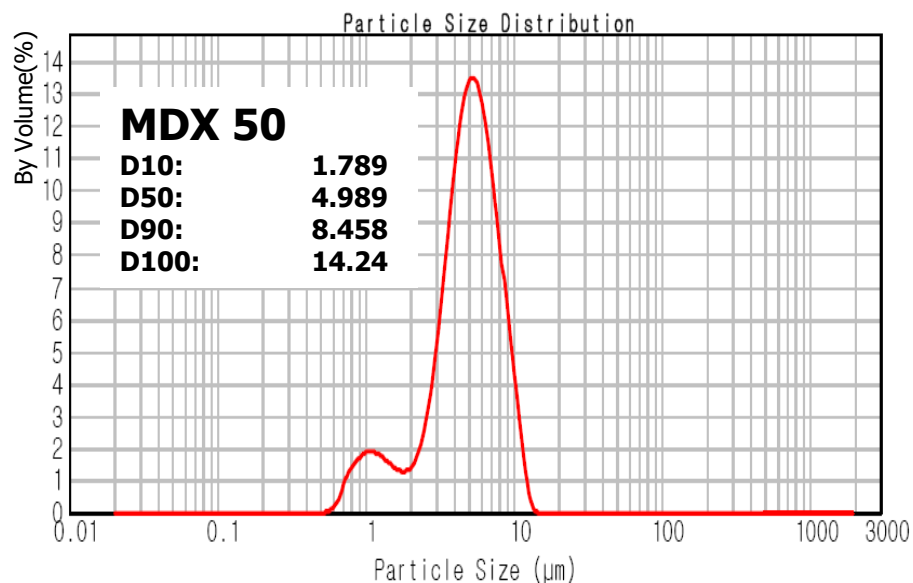


# MDX PARTICLE SIZE DISTRIBUTION

中分散



Particle Size Analyzer : MALVERN Mastersizer2000

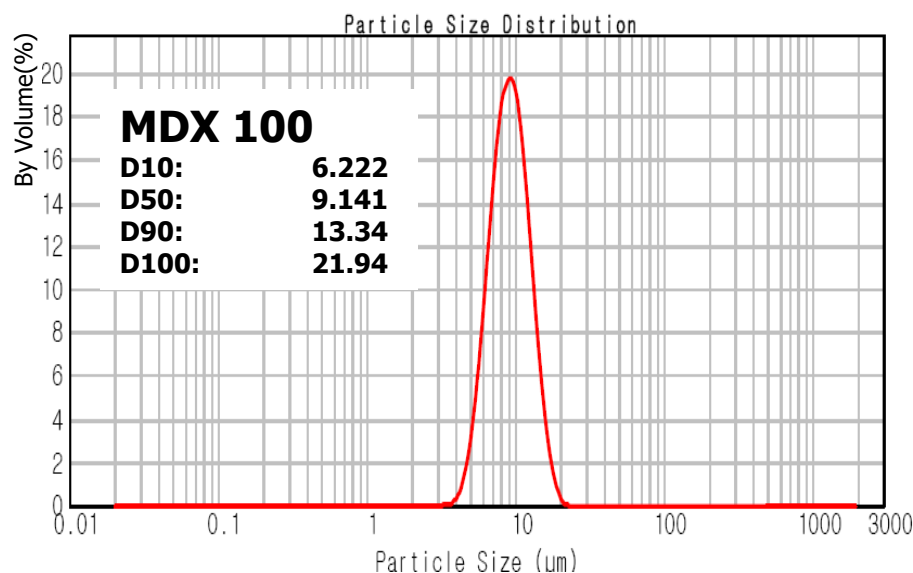


Size (μm)	Volume In %
0.105	0.00
0.120	0.00
0.138	0.00
0.158	0.00
0.182	0.00
0.209	0.00
0.240	0.00
0.275	0.00
0.316	0.00
0.363	0.00
0.417	0.00
0.479	0.00
0.550	0.11
0.631	0.52
0.724	1.15
0.832	1.49
0.955	1.69
1.096	0.00

Size (μm)	Volume In %
1.096	1.66
1.259	1.49
1.445	1.27
1.660	1.14
1.905	1.26
2.188	1.83
2.512	3.02
2.884	4.94
3.311	7.39
3.802	9.83
4.365	11.61
5.012	12.19
5.754	11.49
6.607	9.80
7.586	7.50
8.710	5.05
10.000	2.78
11.482	0.00

Size (μm)	Volume In %
11.482	0.77
13.183	0.01
15.136	0.00
17.378	0.00
19.953	0.00
22.909	0.00
26.303	0.00
30.200	0.00
34.674	0.00
39.811	0.00
45.709	0.00
52.481	0.00
60.256	0.00
69.183	0.00
79.433	0.00
91.201	0.00
104.713	0.00
120.226	0.00

D100



Size (μm)	Volume In %
1.096	0.00
1.259	0.00
1.445	0.00
1.660	0.00
1.905	0.00
2.188	0.00
2.512	0.00
2.884	0.00
3.311	0.04
3.802	0.31
4.365	1.52
5.012	4.08
5.754	8.20
6.607	12.90
7.586	16.67
8.710	17.88
10.000	15.93
11.482	0.00

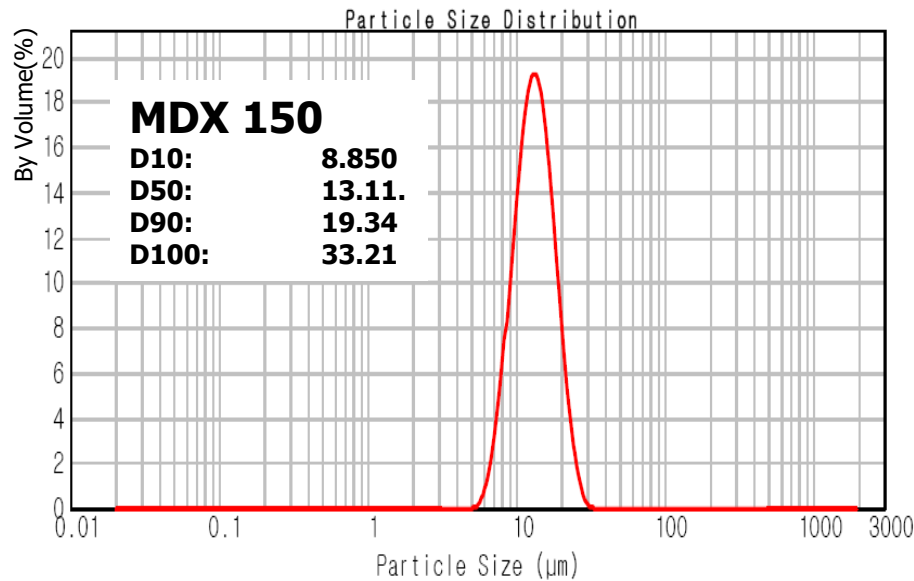
Size (μm)	Volume In %
11.482	11.67
13.183	6.80
15.136	3.03
17.378	0.89
19.953	0.08
22.909	0.00
26.303	0.00
30.200	0.00
34.674	0.00
39.811	0.00
45.709	0.00
52.481	0.00
60.256	0.00
69.183	0.00
79.433	0.00
91.201	0.00
104.713	0.00
120.226	0.00

D100

# MDX PARTICLE SIZE DISTRIBUTION

中分散

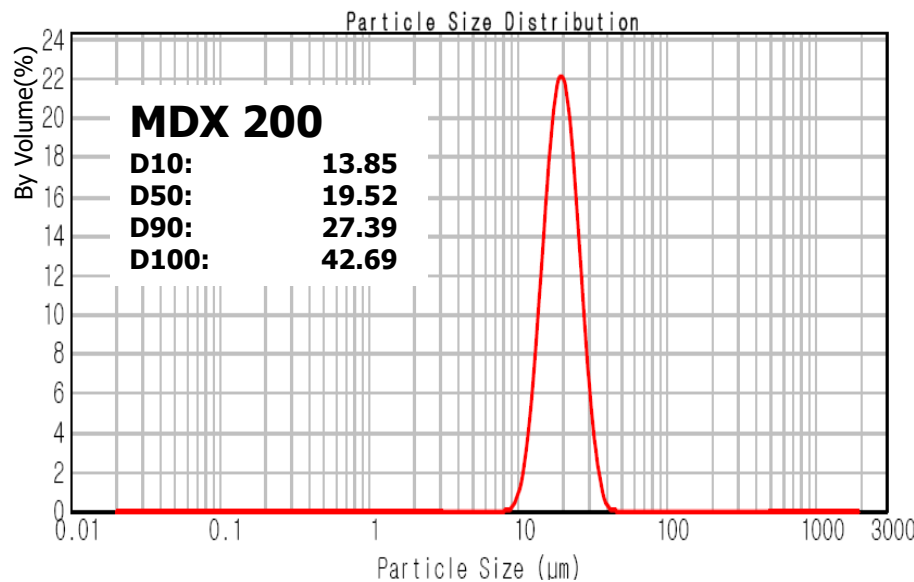
Particle Size Analyzer : MALVEN Mastersizer2000



Size (μm)	Volume In %
1.096	0.00
1.259	0.00
1.445	0.00
1.660	0.00
1.905	0.00
2.188	0.00
2.512	0.00
2.884	0.00
3.311	0.00
3.802	0.00
4.365	0.00
5.012	0.04
5.754	0.69
6.607	2.51
7.586	5.82
8.710	10.12
10.000	14.40
11.482	

Size (μm)	Volume In %
11.482	17.05
13.183	17.01
15.136	14.26
17.378	9.86
19.953	5.46
22.909	2.27
26.303	0.49
30.200	0.01
34.674	0.00
39.811	0.00
45.709	0.00
52.481	0.00
60.256	0.00
69.183	0.00
79.433	0.00
91.201	0.00
104.713	0.00
120.226	0.00

D100.



Size (μm)	Volume In %
1.096	0.00
1.259	0.00
1.445	0.00
1.660	0.00
1.905	0.00
2.188	0.00
2.512	0.00
2.884	0.00
3.311	0.00
3.802	0.00
4.365	0.00
5.012	0.00
5.754	0.00
6.607	0.00
7.586	0.00
8.710	0.00
10.000	0.25
11.482	1.64

Size (μm)	Volume In %
11.482	5.02
13.183	10.43
15.136	16.14
17.378	19.69
19.953	19.08
22.909	14.59
26.303	8.58
30.200	3.63
34.674	0.90
39.811	0.04
45.709	0.00
52.481	0.00
60.256	0.00
69.183	0.00
79.433	0.00
91.201	0.00
104.713	0.00
120.226	0.00

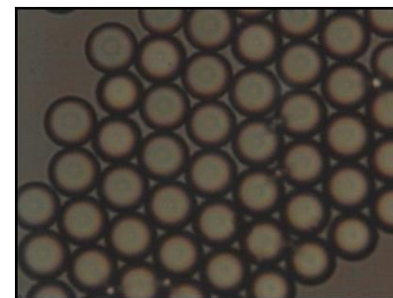
D100.

# MAX series are Mono-Dispersed PMMA Beads

單分散

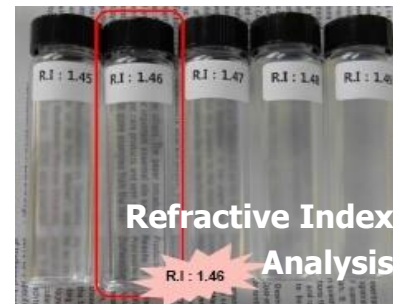
Crosslinked PMMA bead  
Mono-dispersed  
Refractive Index: 1.49  
Yellow Index: 3.0 Max  
CV: <15

Grade	Descriptions		Particle Size ( $\mu\text{m}$ )	
	R.I	C.V	D50	D100
MAX50	1.49	15	4 ~ 6	15
MAX100	1.49	15	8 ~ 11	22
MAX150	1.49	15	13~17	28
MAX200	1.49	15	17.5~22.5	35



Alkyl silane treated  
**Low RI MAX series**  
Refractive Index: **1.46**  
Yellow Index: 2.5 Max  
CV: <15

Grade	Descriptions		Particle Size ( $\mu\text{m}$ )	
	R.I	C.V	D50	D100
MAX50LAS	1.46	15	4 ~ 6	15
MAX100LAS	1.46	15	8 ~ 11	22
MAX150LAS	1.46	15	13~17	28
MAX200LAS	1.46	15	17.5~22.5	35

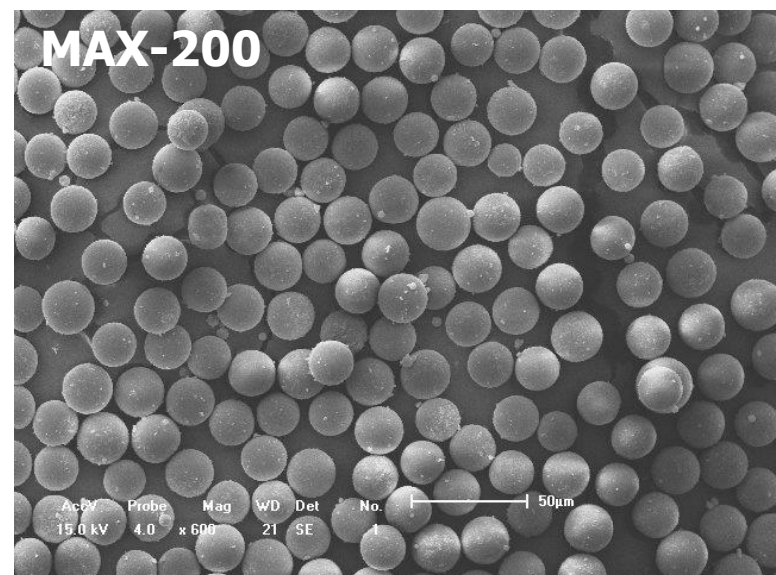
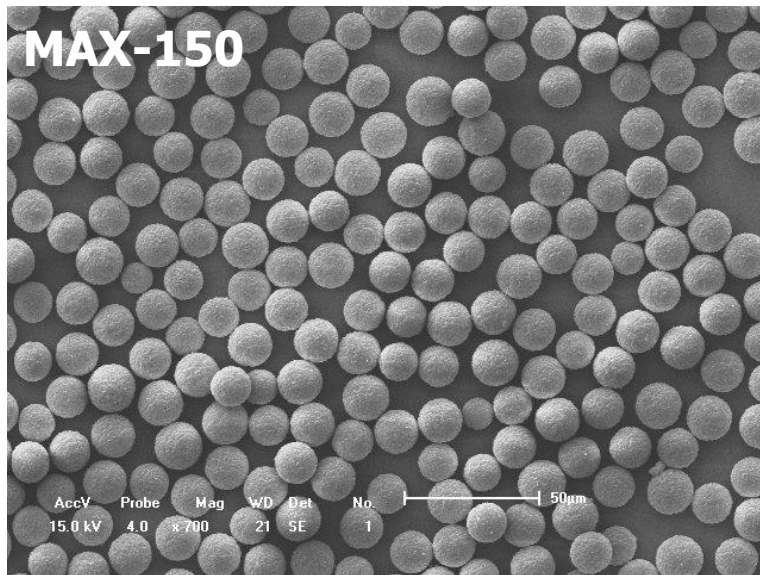
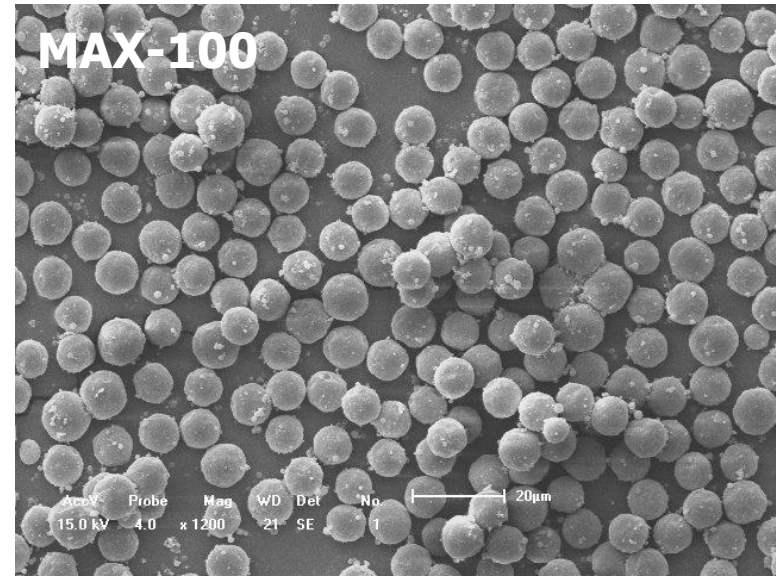
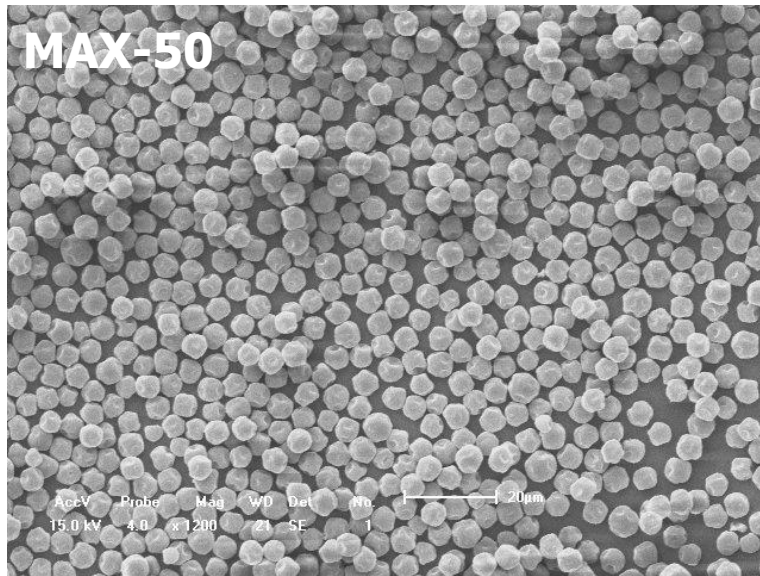


Best recommend for

(1) High Brightness Light Diffusion Film





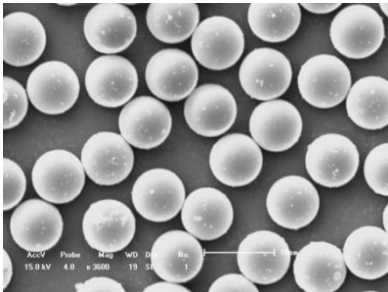


# SAX series are Mono-Dispersed Poly Styrene Beads

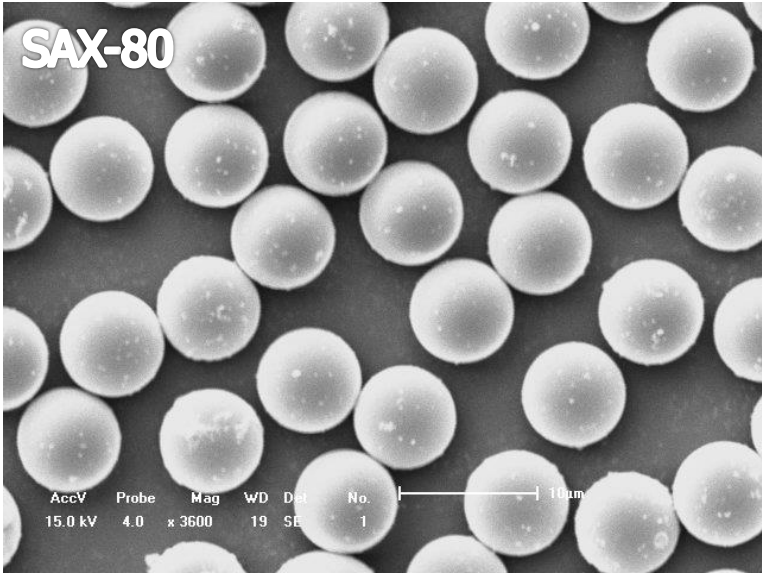
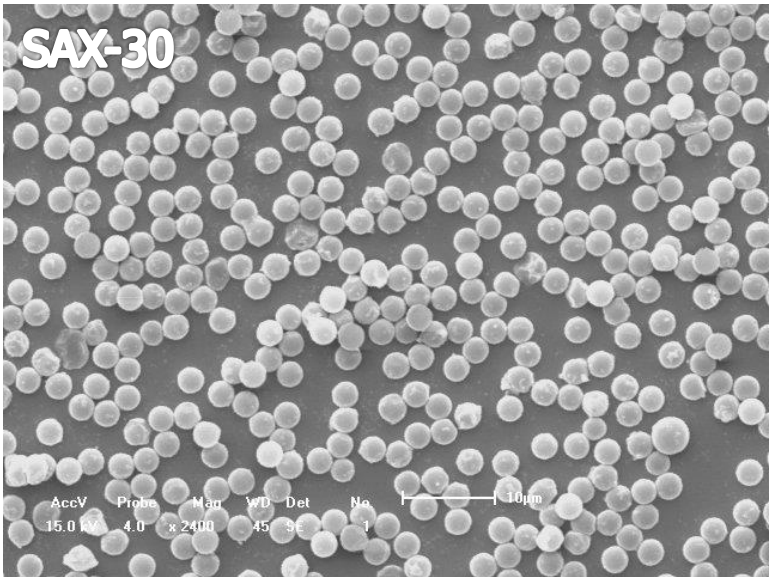
單分散

Crosslinked PS bead  
Mono-dispersed  
Refractive Index: 1.59  
Yellow Index: 3.0 Max  
CV: <15

Grade	Descriptions		Particle Size (μm)	
	R.I	C.V	D50	D100
SAX30	1.59	15	3.0±1.0	12
SAX80	1.59	15	8.0±1.5	20







# High Refractive Index PS Bead

高屈折率

Crosslinked PS bead  
Poly-dispersed  
Yellow Index: 3.0 Max

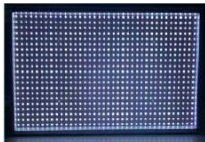
聚苯乙烯  
高折射率

Grade	Descriptions	Particle Size (μm)	
		D50	D100
HR56-40	RI 1.56	4.5±1.5	20.00
HR56-80	RI 1.56	7.5±1.5	27.00
HR59-40	RI 1.59	4.5±1.5	20.00
HR59-80	RI 1.59	7.5±1.5	27.00

## Best recommend for

(1) High HAZE Light Diffusion Film

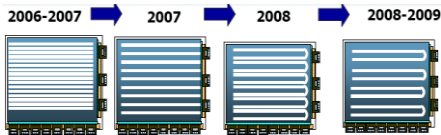
Trend 1: LED backlight



Trend 2: Slim LCD



Trend 3: Fewer CCFL



The higher haziness required, Higher and Lower RI Beads needed

Grade	Descriptions	Particle Size (μm)	
		D50	D100
LR43-40	RI 1.43	4.5±1.5	20.00

# HLDP series are of the highest Heat Resistant PMMA Beads

高耐熱性

Crosslinked PMMA bead

Poly-dispersed

Refractive Index: 1.49

Yellow Index: 2.5 Max

TGA data

T<sub>1%</sub> 214.99°C

T<sub>5%</sub> 314.96°C

T<sub>10%</sub> 326.10°C

Residue(@ 500°C) <0.5%

Grade	Descriptions	Particle Size (μm)	
		D50	D100
HLDP 20	PMMA bead	1.5 ~ 2.5	11.83
HLDP 50	PMMA bead	5 ~ 7	15.65

Best recommend for

(1) Plastic Molding & Extrusion for LED Lighting



(2) Light Diffusion Plate, Light Guide Plate



PMMA的耐热稳定性好

樹脂 射出 or 壓出 用途

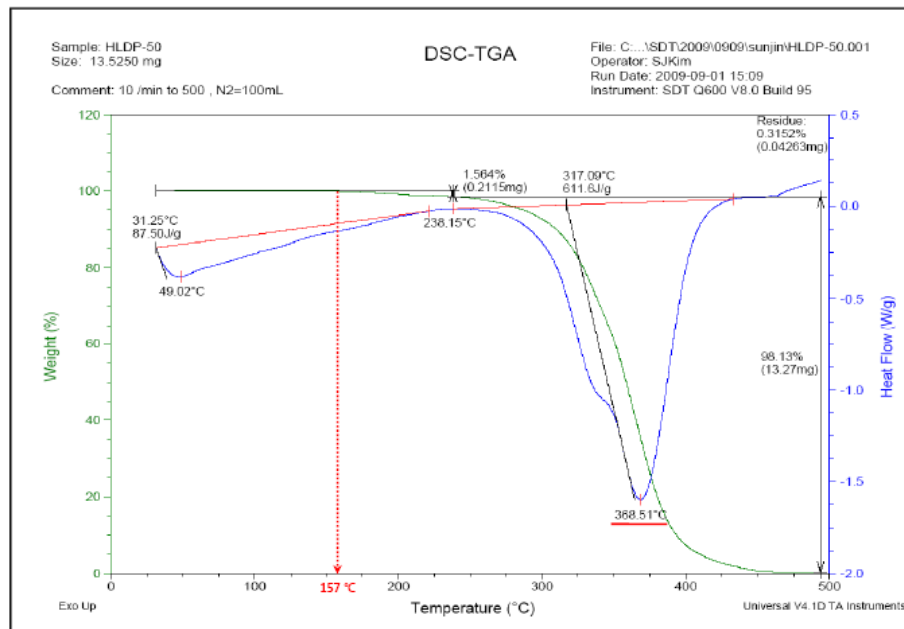
*"HLDP, Specially developed for PC resin compounding*

*For LED Lighting"*

# HLDP Heat Resistance Data

高耐熱性

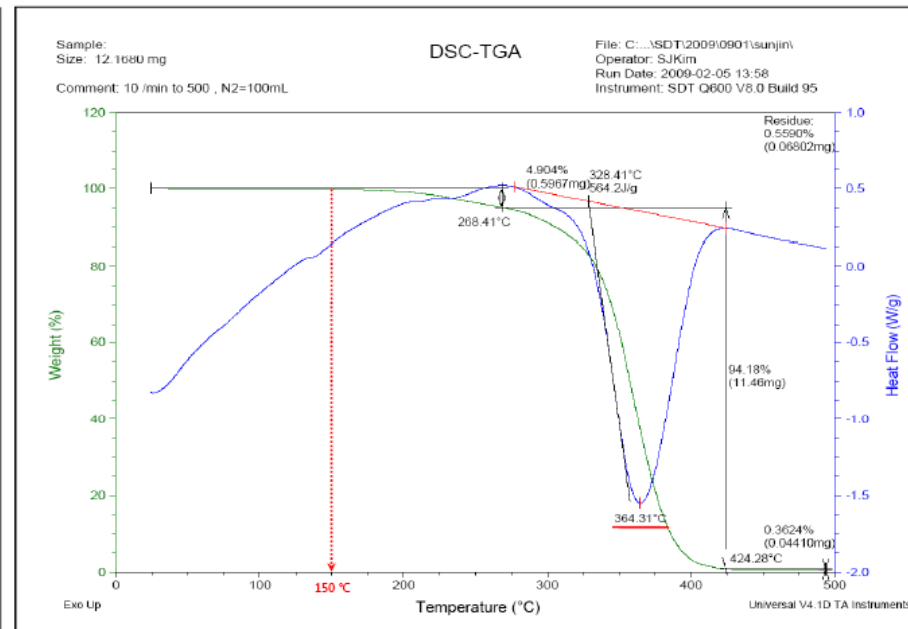
## TGA ANALYSIS – HLDP50



At 250C 30min  
Yellow Index 0.51 → 5.81

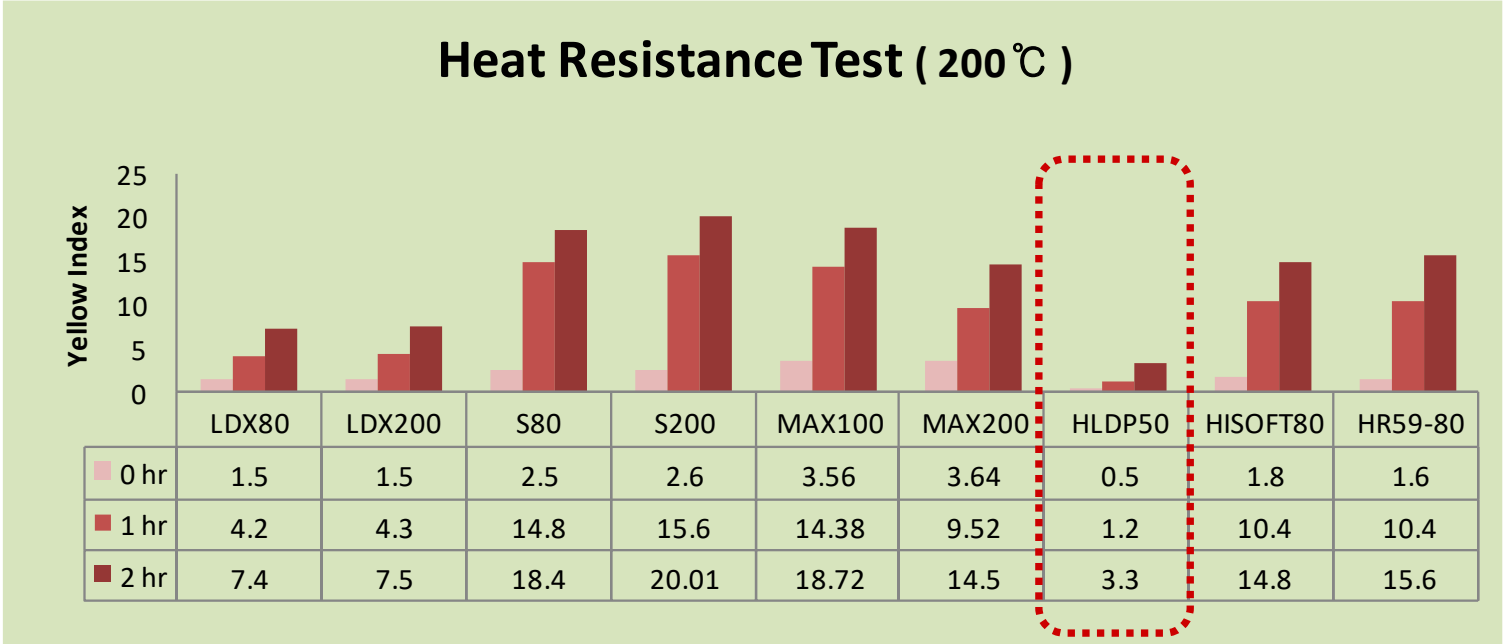


## TGA ANALYSIS Competitor's



At 250C 30min  
Yellow Index 1.95 → 6.86





*"HLDP, has excellent Heat Resistance"*

# SUNPMMA-S series, for Paint & Coating applications

塗料用

Crosslinked PMMA bead  
Poly-dispersed  
Refractive Index: 1.49  
Yellow Index: 3.0 Max



Grade	D <sub>50</sub>	D <sub>100</sub>
SUNPMMA-S50C	4 - 8 μm	11.83 μm
SUNPMMA-S50	4 - 8 μm	15.65 μm
SUNPMMA-S100	8 - 11 μm	22.73 μm
SUNPMMA-S150	11-15 μm	30.07 μm
SUNPMMA-S200	17-21 μm	36.24 μm
SUNPMMA-S250	20-24 μm	43.67 μm
SUNPMMA-S300	25-30 μm	57.77 μm
SUNPMMA-S400	30-40 μm	69.61 μm
SUNPMMA-S500	40-50 μm	83.89 μm
SUNPMMA-S600	50-60 μm	121.8 μm
SUNPMMA-S700	60-70 μm	161.2 μm
SUNPMMA-S800	70-80 μm	161.2 μm
SUNPMMA-S900	80-90 μm	234 μm

## Anti Scratch & Texture agent

### More repeatable and uniform Texture

- ⇒ Real spherical
- ⇒ Tight oversized particle control

### Better Anti Scratch

- ⇒ Higher hardness of PMMA
- ⇒ Better slip due to real spherical shape

### Higher Melting point

- ⇒ No loss of texture in air dry or bake systems
- ⇒ Higher processing temperature, better productivity

### Hard to fall off from the film due to its compatibility binder

### Solvent resistance

- ⇒ Easy to disperse
- ⇒ Better stability

## Best recommend for

塑膠漆和金属漆中作为抗刮  
伤剂&质感纹理剂

### (1) Plastic & Coil Coating



塑膠漆



金属漆

### (2) Additive to Release Agent

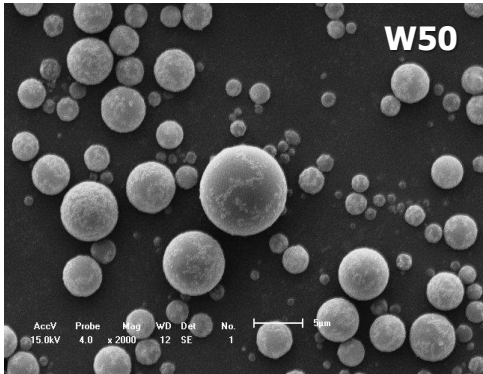


# Small Size COLOR PMMA Beads for Optics / Paint & Coating

彩色

COLOR Acryl beads  
Poly-dispersed

Grade	Descriptions	Particle Size (μm)	
		D50	D100
SUNPMMA-W50	TiO2 30%	4 ~ 6	15.65



Best recommend for

- 1) W50 Spacer for Reflection film for LCD BLU

# SUNPAN, PolyAcryloNitrile Beads for "Leather like" special texture

塗料用

Crosslinked Acryl beads  
Poly-dispersed  
Yellowish color  
Refractive Index: 1.52

Grade	Descriptions	Particle Size ( $\mu\text{m}$ )	
		D50	D100
SUNPAN160	Most Soft	14 ~ 18	57.77
SUNPAN300	Most Soft	28 ~ 32	110

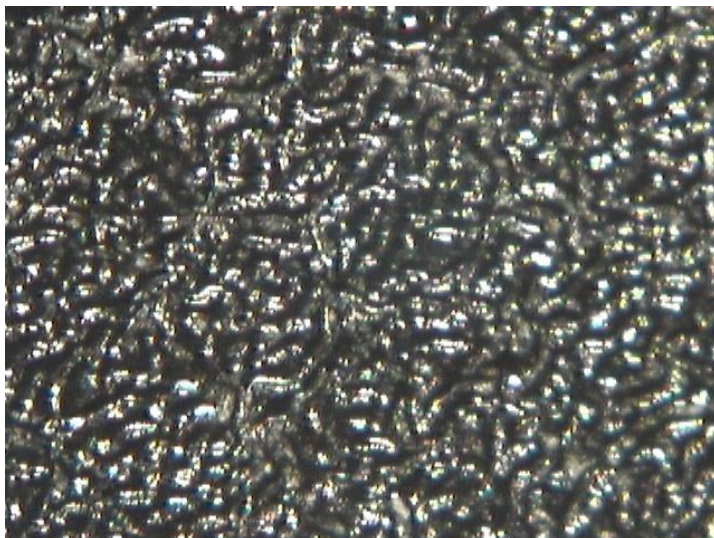
## Best recommend for

- (1) "Leather Like" texture for paint & coating
- (2) Highly elastic texture / Satin gloss

### "Typical texture" by SUNPAN

聚丙烯腈粉体应用于涂料

皮革般轻柔触感  
高弹性质感



Poly AcryloNitrile Bead

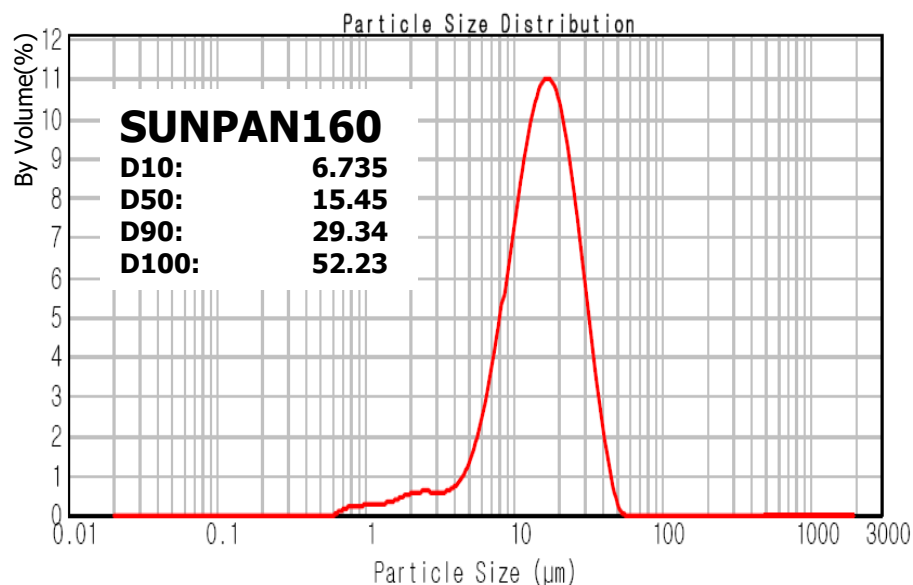
### Typical Texture by SUNPMMA-S series



PMMA Bead

# SUNPAN PARTICLE SIZE DISTRIBUTION

塗料用

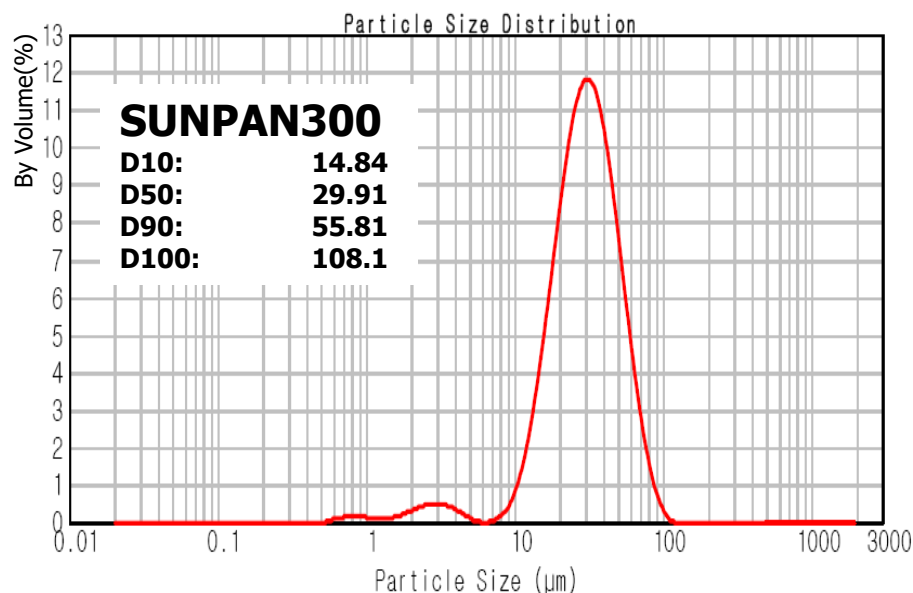


Size (μm)	Volume In %
0.105	0.00
0.120	0.00
0.138	0.00
0.158	0.00
0.182	0.00
0.209	0.00
0.240	0.00
0.275	0.00
0.316	0.00
0.363	0.00
0.417	0.00
0.479	0.00
0.550	0.00
0.631	0.09
0.724	0.17
0.832	0.20
0.955	0.21
1.096	0.22

Size (μm)	Volume In %
1.096	0.22
1.259	0.25
1.445	0.31
1.660	0.40
1.905	0.48
2.188	0.52
2.512	0.53
2.884	0.51
3.311	0.53
3.802	0.65
4.365	0.93
5.012	1.43
5.754	2.19
6.607	3.21
7.586	4.47
8.710	5.86
10.000	7.30
11.482	8.55

Size (μm)	Volume In %
11.482	8.55
13.183	9.50
15.136	9.93
17.378	9.78
19.953	9.03
22.909	7.75
26.303	6.13
30.200	4.38
34.674	2.74
39.811	1.37
45.709	0.37
52.481	0.00
60.256	0.00
69.183	0.00
79.433	0.00
91.201	0.00
104.713	0.00
120.226	0.00

D100



Size (μm)	Volume In %
0.105	0.00
0.120	0.00
0.138	0.00
0.158	0.00
0.182	0.00
0.209	0.00
0.240	0.00
0.275	0.00
0.316	0.00
0.363	0.00
0.417	0.00
0.479	0.00
0.550	0.00
0.631	0.06
0.724	0.10
0.832	0.13
0.955	0.12
1.096	0.11

Size (μm)	Volume In %
1.096	0.09
1.259	0.08
1.445	0.12
1.660	0.19
1.905	0.28
2.188	0.37
2.512	0.43
2.884	0.44
3.311	0.39
3.802	0.29
4.365	0.17
5.012	0.04
5.754	0.00
6.607	0.01
7.586	0.15
8.710	0.48
10.000	1.10
11.482	2.05

Size (μm)	Volume In %
11.482	2.05
13.183	3.36
15.136	4.94
17.378	6.68
19.953	8.34
22.909	9.70
26.303	10.51
30.200	10.63
34.674	10.04
39.811	8.82
45.709	7.16
52.481	5.35
60.256	3.61
69.183	2.15
79.433	1.06
91.201	0.39
104.713	0.05
120.226	0.00

D100

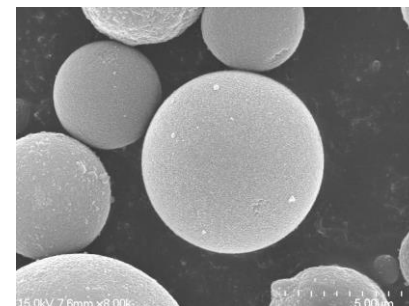
Particle Size Analyzer : MALVEN Mastersizer2000

# SUNSIL, Silica Beads for COATING HARDNESS

硬度向上

Porous silica Beads  
Yellow Index: 3.0 Max  
Refractive Index: 1.47

Grade	Descriptions	Particle Size ( $\mu\text{m}$ )	
		D50	D100
SUNSIL 20	2 $\mu\text{m}$ , porous silica	1 ~ 3	16
SUNSIL 50	5 $\mu\text{m}$ , porous silica	4 ~ 7	20
SUNSIL 130	7 $\mu\text{m}$ , porous silica	6 ~ 9	30
SUNSIL 150H	13 $\mu\text{m}$ , porous silica	10 ~ 15	35



## Best recommend for

(1) flatting agent for film coating.  
(消光劑)

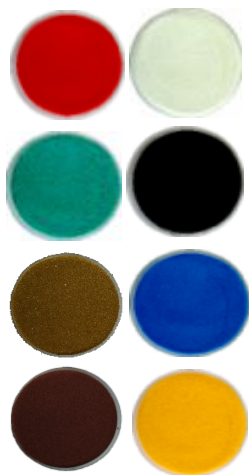


(2) UV hard coating additive to enhance hardness

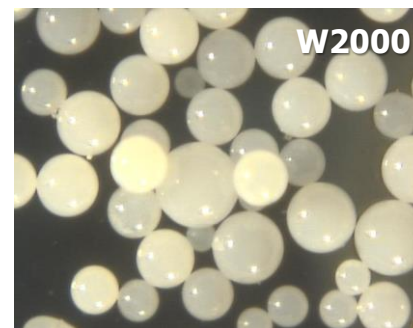


# Large Size COLOR PMMA Beads for Visual Effects for Plastic

COLOR Acryl beads  
Poly-dispersed



Grade	Descriptions	Particle Size ( $\mu\text{m}$ )	
		D50	D100
K2000	Black	180 - 220	400
K1000	Black	80 - 120	250
R2000	Red	180 - 220	400
R1000	Red	80 - 120	250
Y2000	Yellow	180 - 220	400
Y1000	Yellow	80 - 120	250
W2000	White(TiO <sub>2</sub> )	180 - 220	400
W1000	White(TiO <sub>2</sub> )	80 - 120	250
G2000	Green	180 - 220	400
G1000	Green	80 - 120	250
B2000	Blue	180 - 220	400
B1000	Blue	80 - 120	250



Best recommend for

(1) Visual Mosaic Effect for Plastic Molding



Uncrosslinked Acryl beads  
Poly-dispersed  
Narrow molecular weight  
distribution  
Solvent Soluble at Room  
Temp

Grade	Mw	Particle Size (μm)
		D50
UC	250,000 ~ 450,000	10 ~ 30
UC500-L	150,000 ~ 350,000	40 ~ 60
UC500-H	350,000 ~ 700,000	40 ~ 60
UC800-L	150,000 ~ 350,000	70 ~90
UC800-H	350,000 ~ 700,000	70 ~90

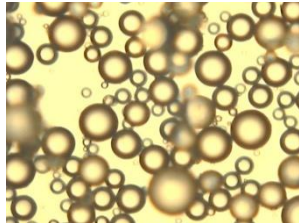
Best recommend for

(1) coatings, printing inks, adhesives, paper processing agent, fiber treatment, acryl cold mounting agent

(2) Dental Acrylic Light Curing Trayplates



低分子量PMMA室温下会溶于MMA



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