

Diasphere[®]

is Organic Polymer
Bead of ASP

Diffusion Agents of diffusion film and plate

Matting/Texture Agent of paint, Ink and plastic

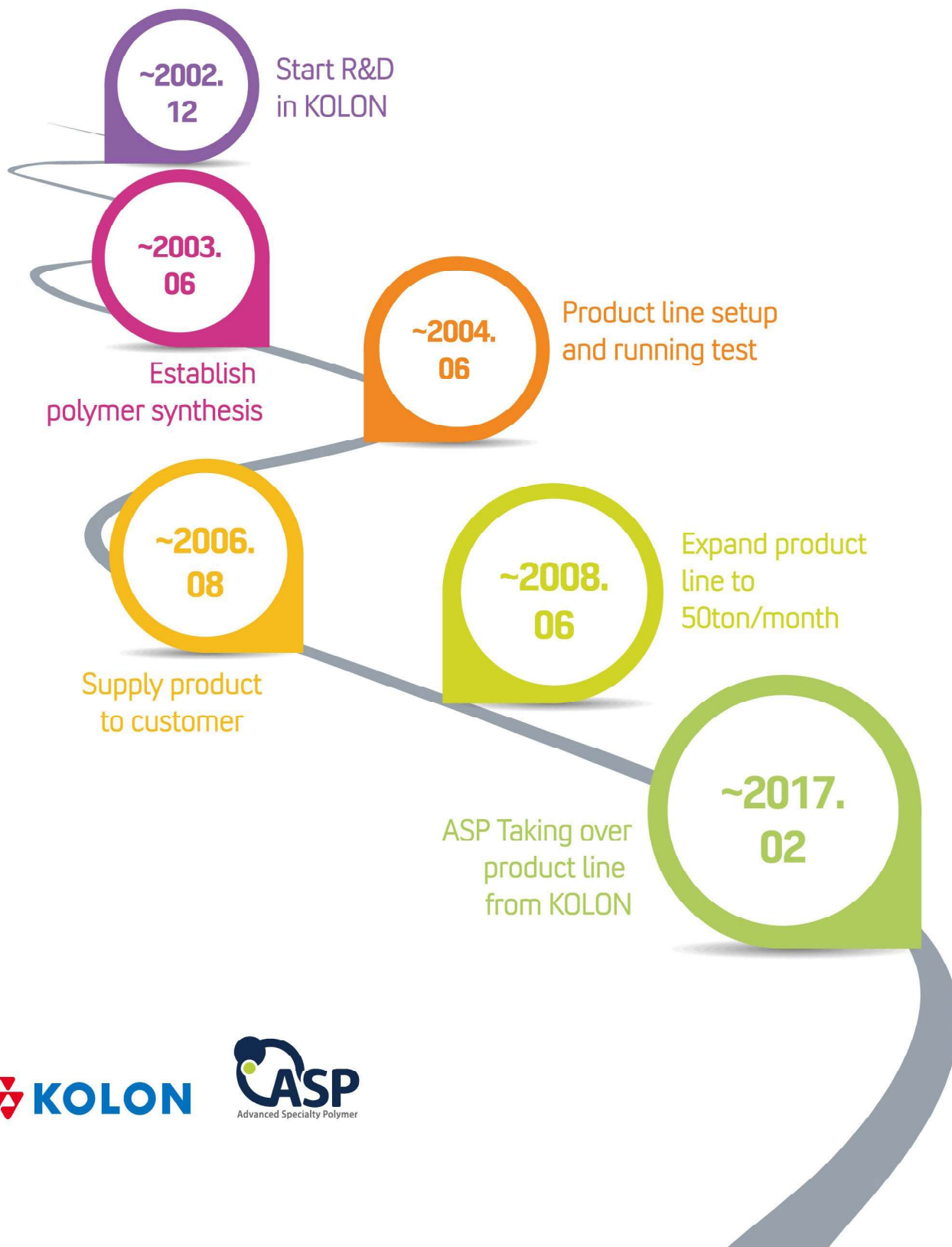
Anti-Blocking Agents of packaging PP film and leather surface

Anti-Glare Agents of functional film

Pore Forming Agents of ceramic material

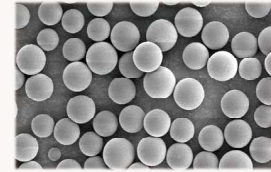
Filler of cosmetics and toiletries

Advanced Specialty Polymer Ltd. for **Diasphere[®]**



Diasphere[®] is the brand name of ASP Co., Ltd

- Spherical polymeric beads having 0.2 ~ 100 μ m average particle size by very unique polymerization technique.
- Functional organic polymeric bead based on acrylic monomer and its co-monomer, styrene monomer and silane derivatives.
- Application : Light diffusing agent for light diffusing film and plate, texture and anti-slip agent for paint and coatings, filler for cosmetics and toiletries, delustering/texture and anti-blocking agent for plastics and film, pore forming agent for ceramic material and so on.



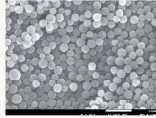
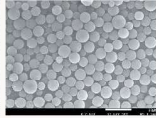
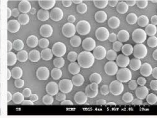
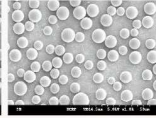
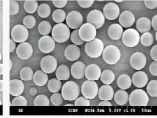
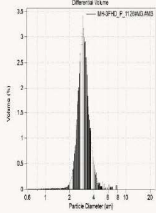
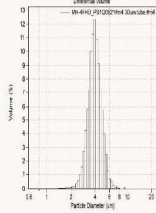
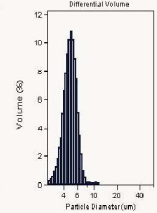
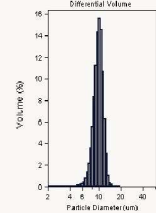
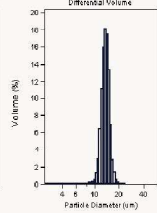
Diasphere[®] Line-up

Material	Grade	Ave. Particle Size(μ m)	Refractive Index	Thermal Property ¹⁾	Hardness ²⁾
Acrylic Polymer (PBMA)	BH-5	5	1.48	240 $^{\circ}$ C~260 $^{\circ}$ C	10
	BH-10	10			
Acrylic Polymer (PMMA)	MH-3FH-D	3	1.49	315 $^{\circ}$ C	27
	MH-4FH-D	4		320 $^{\circ}$ C	
	MH-5FH-D	5		322 $^{\circ}$ C	
	MH-5FD	5			
	MH-10FD	10			
	MH-15FD	14			
	MH-20FD	20			
	MH-25FD	24			
	MH-30FD	30			
	MH-40FD	40			
	MH-50FD	50			
	MH-60FD	60			
	MH-70FD	70			
MH-80FD	80				
MH-100FD	100				
Styrene Polymer (PS)	MS-3FHC	3	1.59	310 $^{\circ}$ C	25
	MS-5FHC	5			
	MS-10FHC	10			
Core/shell type Styrene Polymer in water base (PS)	SNX-200H	0.2	1.49	295 $^{\circ}$ C	25
	SNX-400H	0.4			
	SNX-600H	0.6			
Silicone (PMSQ)	KS-200	2	1.42	Over 400 $^{\circ}$ C	15
	KS-500	5			
	KS-1000	9			

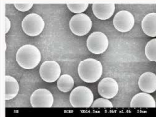
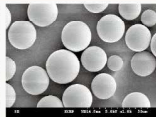
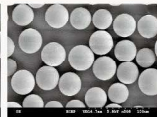
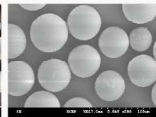
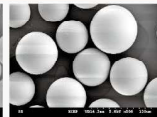
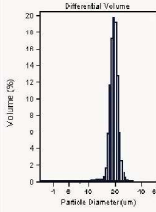
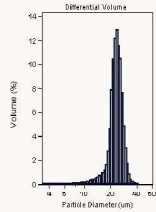
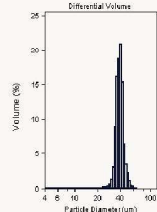
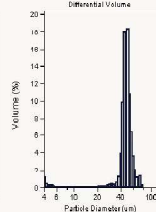
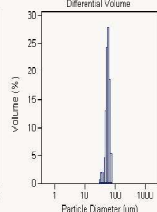
1) 3% Weight Loss by TGA

2) 10% Compression Strength, Mpa by MCTM

Diasphere[®] Line-up

	PMMA				
	MH-3FHD	MH-4FHD	MH-5FHD/5FD	MH-10FD	MH-15FD
SIZE(μm)	3	4	5	10	14
SEM Image					
PSD					

•SEM Image : MH-3FHD, 4FHD, 5FHD x 2.0k and 10FD, 15FD x 1.0k
 •PSD(Particle Size Distribution) : Coulter Multisizer 4

	PMMA				
	MH-20FD	MH-25FD	MH-40FD	MH-60FD	MH-80FD
SIZE(μm)	20	25	40	60	80
SEM Image					
PSD					

•SEM Image : MH-20FD, 25FDx1.0k and MH-40FD, 60FD, 80FDx500
 •PSD(Particle Size Distribution) : Coulter Multisizer 4, LS 13 320

Diasphere® Line-up

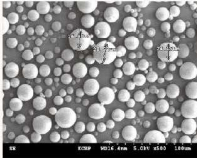
	Styrene	PBMA	Silicone		
	MS-10FHC	BH-5	KS-200C	KS-500	KS-1000
SIZE(μm)	10	5	2	5	9
SEM Image					
PSD					

•SEM Image : MS-10FDC, BH-5 x 1.0k and Silicone x 2.0k
 •PSD(Particle Size Distribution) : Coulter Multisizer 4

Key Characteristic of Diasphere®

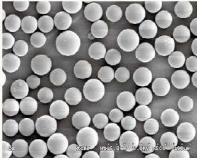
1) Narrow size distribution

Distribution of several types of Polymer bead




Competitors
Over C.V. 30%
Polydispersed

C.V. 30%



ASP Diasphere®
C.V. 10-12%
Medium size distribution

C.V. 20%

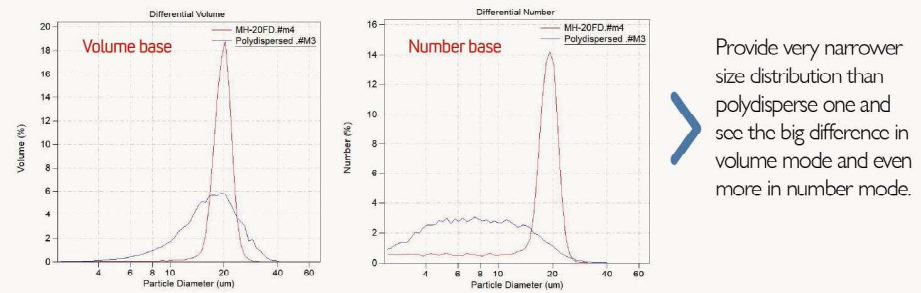


Competitors
C.V. 10%
Monodispersed

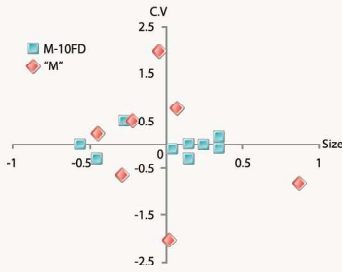
C.V. 10%

C.V. 5%

Same method as polydispersed bead, but provide close to monodispersed product



Key Characteristic of Diasphere®



• Each of square and diamond values mean the variance from mean value.

2) Quality Reliability

- Lower Deviation of Avg. and C.V., Higher Quality Reliability
- Support customer to give higher quality solution

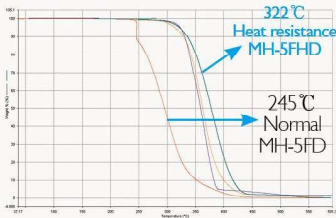
C.V. and Mean size data of MH-10FD and competitor

C.V. (%)	No.	1	2	3	4	5	6	7	8	9	AVG.	Standard Deviation
	MH-10FD		15.0	148	148	15.1	15.0	15.1	15.2	15.6	15.1	15.08
"M"		38.9	39.2	37.8	38.6	37.6	36.4	40.4			38.41	1.29

Size (µm)	No.	1	2	3	4	5	6	7	8	9	AVG	Standard Deviation
	MH-10FD		10.0	98	92	9.1	9.7	9.9	10.0	9.4	9.4	9.66
"M"		11.9	122	11.8	11.6	12.9	12.1	12.1			12.09	0.42

• "M" : Competitor "S" 10µm polydispersed PMMA

Decomposition Temperature(97%)



• TGA Test

3) Higher Heat Resistance Organic Polymer Bead

- Higher decomposition temperature than normal organic bead.
- Not yellowed in process because of less weight loss.
- Recommended where resins are kneaded with high temperature.
- At 280 °C oven test, Heat resistance bead show concrete thermal properties.

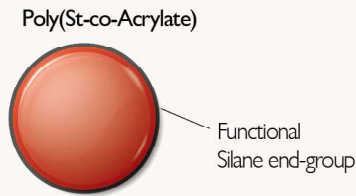
300°C Oven Test	10min	30min	Color Change	Drying Loss
Heat Resistance			No	15%
Normal			Yellow	62.2%

- 10% Bead in M/B with PC matrix and 5% M/B is loaded in PC sheet.

	L*	a*	b*	YI
Heat 5FD MB	76.96	-0.85	0.97	
Normal 5FD MB	75.31	-0.83	1.33	
Heat 5FD PC Sheet	78.81	-0.187	1.407	243
Normal 5FD PC Sheet	77.88	-0.302	1.913	337

Characteristic of Diasphere® for New Application

New Products



Highly crosslinked Polystyrene core/shell structured nano size particle

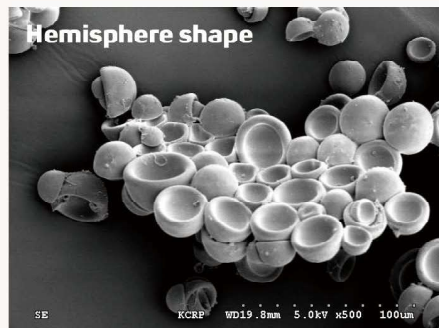
Name	SNX-200H	SNX-400H	SNX-600H
Particle size(nm)	200	400	600
SEM Image (15K)			

• Particle size is measured by Malvern Zetasizer

Key Characteristic of Diasphere®

New Products

Shape controlled bead



Special surface treatment bead with several types of material like metal and inorganic by customer's requirements

Monodispersed PMMA

