Confidential

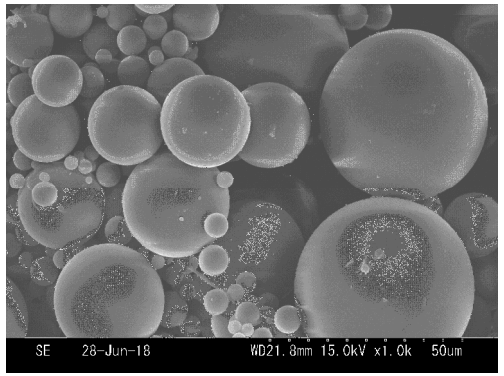
Hi-pearl

introduction

1. about Hi-pearl

Feature

Hi-pearl is the thermoplastic acrylic resin synthesized mainly by suspension polymerization technology. It has excellent weather resistance and transparency, and can be dissolved in various solvents and monomers. Hi-pearl is a hard (high Tg) type resin supplied in beads. Copolymerization of styrene monomers, vinyl acetate monomers, etc., and functional groups such as carboxylic acid, hydroxyl groups, and epoxy groups are also possible. Molecular weight Mw (30,000 to 1 million), particle size (0.01 mm to 0.2 mm), glass transition temperature Tg (20 to 100 ℃) can be controlled. We have achievements in manufacturing by solution polymerization and emulsifying polymerization.



Applications

Used in paint and ink binders, resist materials, ceramic binders, etc.

2. Feature of Hi-pearl

2-1 M-4000, 5000 series

P.N.	M-4006	M-4501	M-5000
appearance	white beads	white beads	white beads
Tg (℃)	105	84	65
Mw	35,000	1,000,000	1,000,000
functional group	non	non	non
toluene solution	40% 1500mPa·s	10% 500mPa·s	10% 250mPa·s

Features: It can be dissolved in organic solvents such as toluene, ketones and esters.

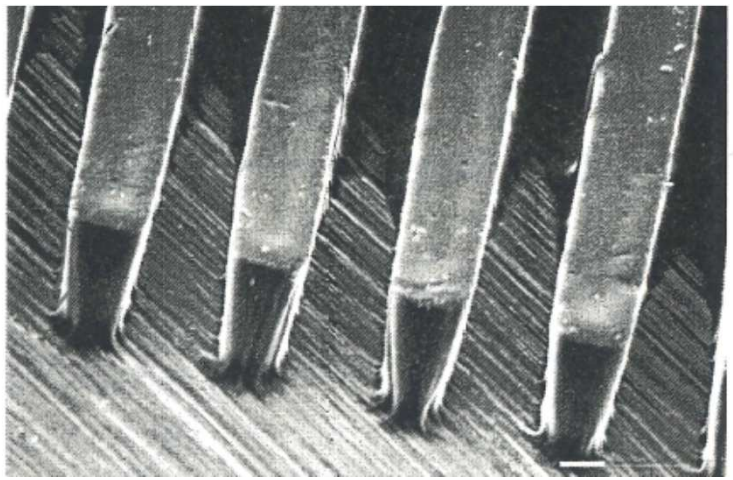
Application: Paint, Ink (binder)

2. Feature of Hi-pearl

2-2 MA-4620 ～alkaline developing type resist polymer～

・ For high acid value, alkali development is possible. → It is used in binder applications for dry film resists, resist inks, and conductive pastes.
・ Since the molecular weight distribution is sharper than that of solution polymerization products, it is possible to create a high-resolution resist.
・ Glass transition temperature (Tg), molecular weight, and acid value can be adjusted according to request.

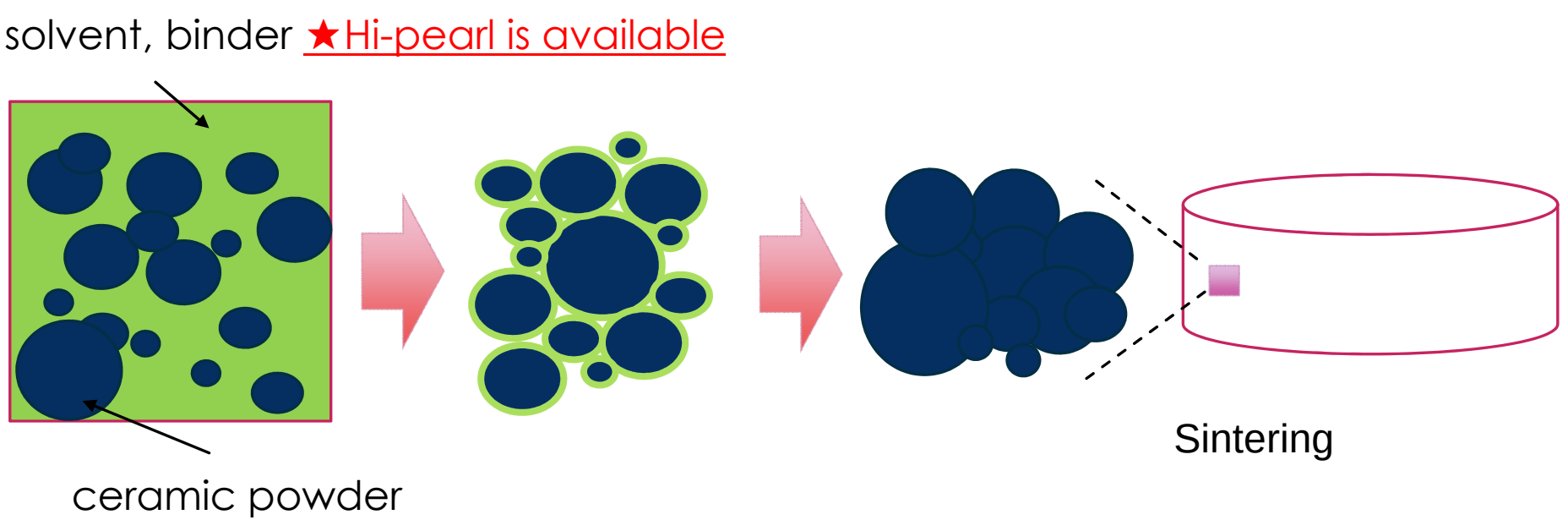
P.N.	MA-4620
appearance	white beads
Tg (℃)	56
Mw	90,000
functional group	Acid value 130KOHmg/g



2. Feature of Hi-pearl

2-3 M-6000 series

Hi-pearl is used as a binder when ceramic sintering. There is little residue at the firing, so good molding can be obtained.

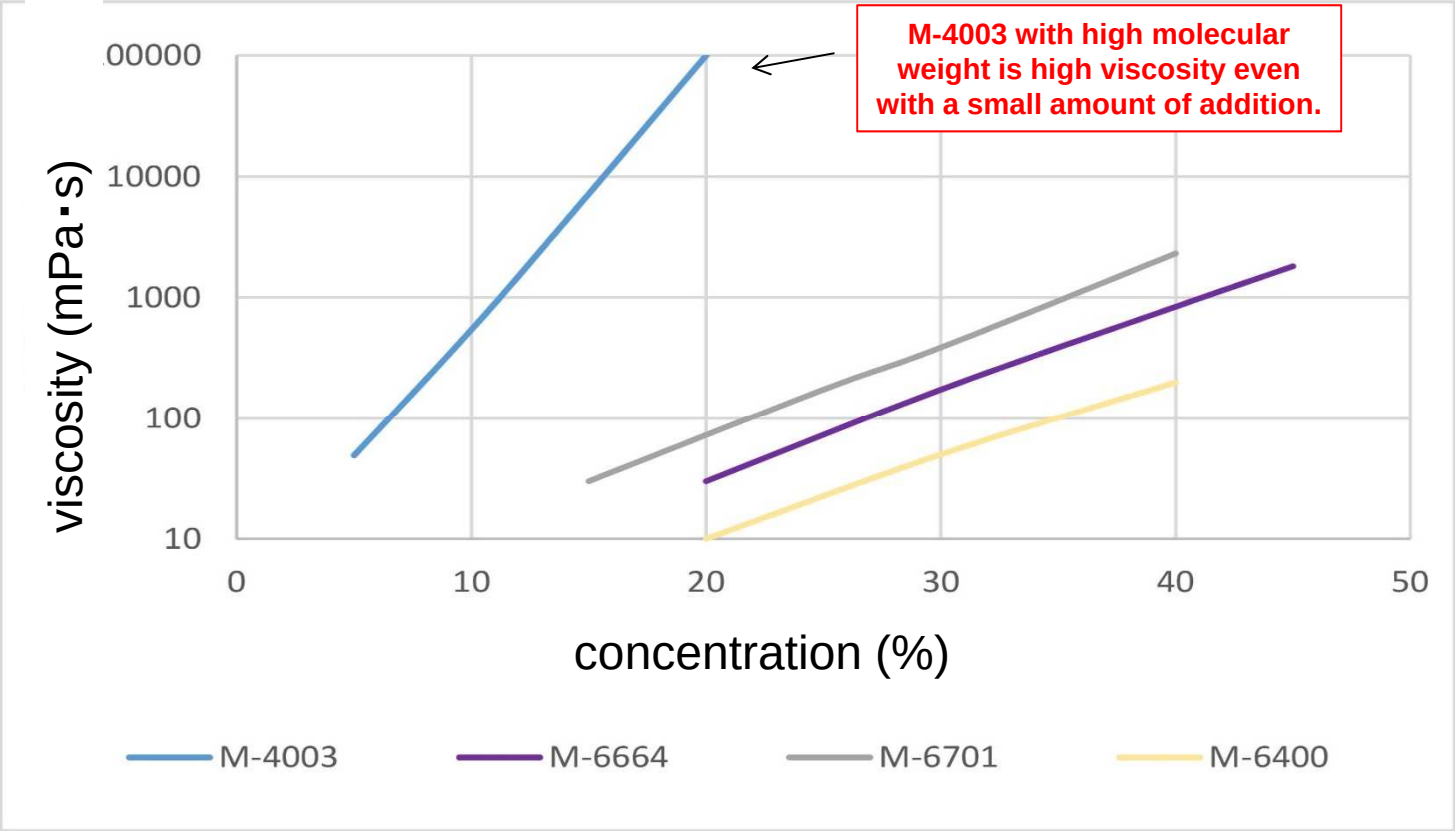


◆ Hi-pearl for ceramic binder

P.N.	M-4003	M-6003	M-0603	M-6664	M-6701	M-6400
monomer composition	MMA	BMA	BMA	BMA	BMA	BMA/MMA
Mw	1,000k	350k	150k	200k	250k	50k
Tg(℃)	105℃	20℃	48℃	36℃	26℃	49℃
toluene soln. solids (%) visc.(mPa･s)	10 500	30 600	30 100	30 200	30 450	30 50
decomposition temp. (℃) 1% 5% 50% 95%	 163 243 295 372	 165 228 264 304	 155 261 285 302	 153 227 258 292	 240 257 291 324	 79 184 272 374
ash (%)	≦0.1	≦0.1	≦0.1	≦0.1	≦0.1	≦0.1

- Molecular weight can be controlled from tens of thousands to more than 1000k.
- It exhibits better pyrolysis properties compared to cellulose and butyral resins commonly used as ceramic binders.
- M-6000 series, which completely decomposes below 350℃, is widely used as ceramic binder.

◆ Concentration and viscosity curve in toluene solution



2. Feature of Hi-pearl

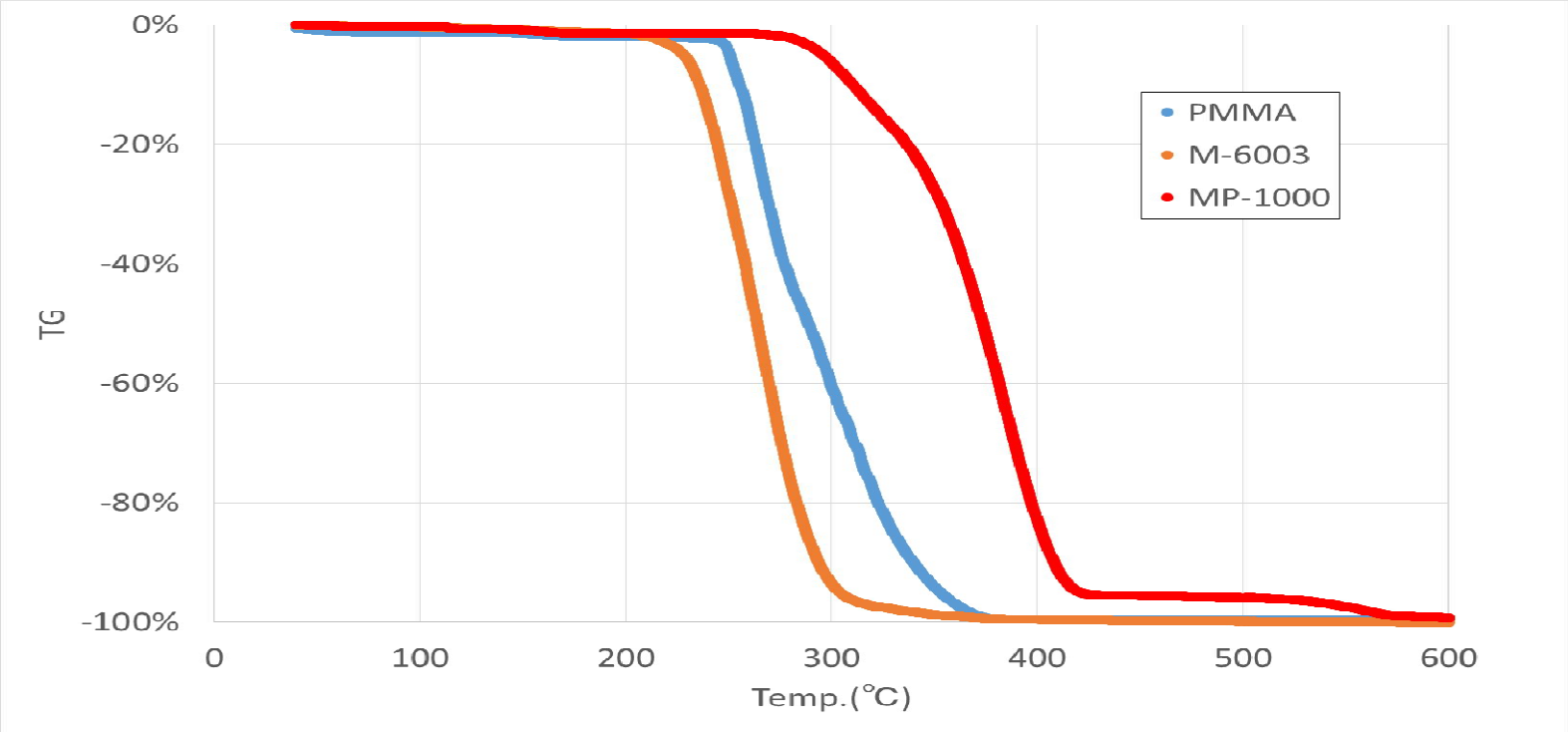
2-4 MP-1000

P.N.	MP-1000
appearance	light brown beads
Tg (℃)	129
Mw	130,000
functional group	non

Features: High heat resistance

Application: Paints that require heat resistance

Pyrolysis curve



P.N.	PMMA	M-6003	MP-1000
5% decomposition (℃)	250	228	296
50% decomposition (℃)	289	263	375
95% decomposition (℃)	353	304	563

3. Compliance with laws and regulations

Hi-pearl	JAPAN	TSCA	China	Taiwan	Korea
M-4006	Listed	Listed	Listed	Listed	Listed
M-4501	Listed	Listed	Listed	Listed	Listed
M-5000	Listed	Listed	Listed	Listed	Listed
MA-4620	Listed	—	Listed	Listed	Listed
M-6003	Listed	Listed	Listed	Listed	Listed
M-0603	Listed	Listed	Listed	Listed	Listed
M-6664	Listed	Listed	Listed	Listed	Listed
M-6701	Listed	Listed	Listed	Listed	Listed
M-6400	Listed	Listed	Listed	Listed	Listed
MP-1000	Listed	—	Listed	Listed	—