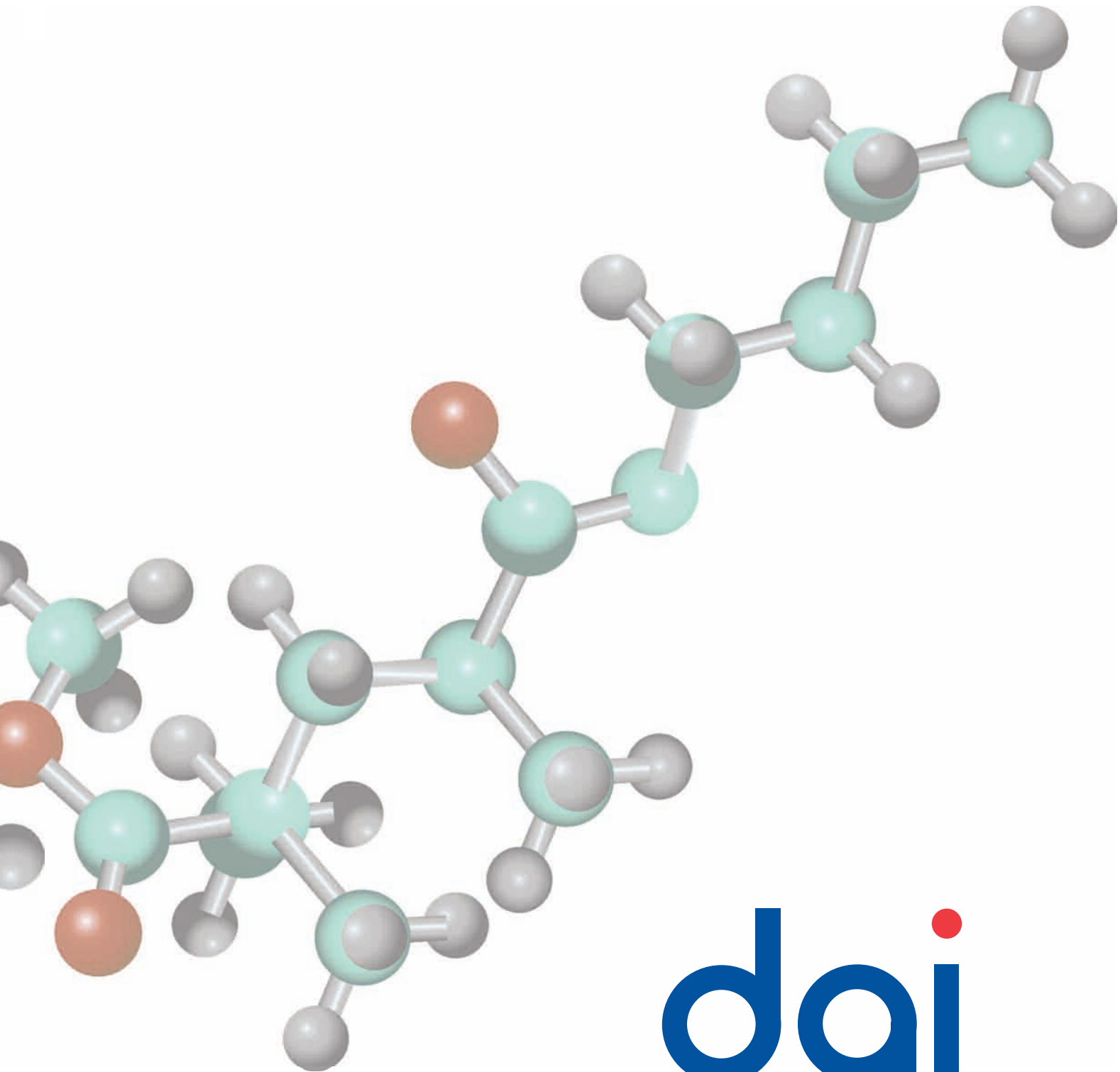


DIANAL Resins



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DIANAL AMERICA, INC.

Resin Technology For The Future

Welcome

Dianal America, Inc. (DAI) began operations in 1992 at its manufacturing facility in Pasadena, Texas, and currently produces over 70 standard commercial and custom specialty product grades. Dianal America, Inc. is a wholly-owned subsidiary of Mitsubishi Rayon Co., Ltd. (MRC).

Dianal America, Inc. and our resins are UNIQUE and SPECIAL for three primary reasons:

Our Plant

DAI produces resins in one of the newest acrylic resin plants in North America. Our state-of-the-art plant is ISO 9001:2000 certified. In addition to our main production facility, DAI has a pilot plant and a developmental facility for scaling up products which can be tailored to your specific requirements.

Our Process

DAI produces bead resins by a suspension polymerization process. This results in a narrow molecular weight distribution (polydispersity). The narrower range results in fewer lower molecular weight fractions which detract from weathering, toughness, and solvent resistance. It also minimizes the number of higher molecular weight fractions which can cause poorer application properties and lengthen dissolving time.

Our People

DAI has a staff of production, laboratory, sales, and customer service personnel who are dedicated to providing our customers with the highest quality products as well as the highest standards of customer service in the industry. We are proud to say that DAI has one of the best retained experience rates, and lowest turnover rates, in our industry. Shown here are some of our employees who have been instrumental in our success:



Anita – Accounting Supervisor



Rick – Customer Service & Logistics



Mel – Quality Supervisor



Philip – Shift Supervisor



Donghai – Product Development Chemist



Roel – Warehouse Supervisor

Properties of Acrylic Bead Resins

Dianal resins are solid, free-flowing, non-dusting spherical beads with a typical mean particle size between 80 and 200 microns. Each resin offers its own characteristic features, as detailed on the charts which follow on pages 4 and 5.

DAI offers a wide range of product chemistries, including thermoplastics, carboxyl functional and hydroxyl functional grades. The properties of these resins can be enhanced by blending with each other; with other additives such as plasticizers; or with other resins. Depending on specific grades, Dianal resins are compatible with other resin types including alkyds, nitrocellulose, epoxies, vinyls, melamines, ureas, isocyanates, and cellulose butyrate resins.

In interpreting the information on the product description charts, there are four key properties to consider:

Compositional Effects

Dianal's resin product line is based on acrylate and methacrylate monomers, though some resins do contain styrene or other specialty monomers. Methacrylates offer higher hardness as compared to the corresponding acrylate esters. Methacrylates also offer better resistance to weathering than acrylates. Common esters used to produce acrylic polymers are methyl, ethyl, n-butyl, and i-butyl. These form the side chains on the polymer backbone. Polymer hardness decreases as the chain length of the ester increases. For example, methyl polymers offer the highest hardness: ethyl is softer, and butyl esters are softer still. Length of the ester chain also affects solubility and flexibility. As examples, methyl methacrylate polymers are not soluble in non-polar hydrocarbon solvents such as mineral spirits. Butyl grades are soluble in these non-polar solvents.

Glass Transition (T_g)

T_g is a measure of the stiffness (or hardness) of a polymer. T_g is expressed in °C and is the approximate temperature at which the polymer changes from a hard, glassy state to a rubbery, more flexible behavior. Higher T_g values signify a harder polymer. MMA based polymers have the highest T_g values; BMA polymers show lower T_g values. Copolymers exhibit intermediate T_g values.

Molecular Weight

Molecular weight is a measure of the number of monomer units comprising the polymer chain. Molecular weight increases as the length of the polymer chain increases. Increasing the molecular weight of a polymer improves properties such as weathering resistance, solvent resistance, toughness, and abrasion resistance. Solution viscosity and dissolving time also increase.

Functional Groups

DAI offers polymers with various functional groups, including amine, glycidyl, carboxyl, and hydroxyl. Carboxyl and hydroxyl are two of the most commonly used functional groups and are reviewed in more detail below. Functional groups are specific groups of atoms attached to the resin chain backbone and are responsible for the characteristic chemical reactions of those polymers. The functional group will undergo the same or similar chemical reaction(s) regardless of the resin molecular weight. The functionality allows reactions with other resins and other dissolved components; resin crosslinking occurs when resin to resin reactions occur. A crosslinked resin system in a coated film offers the benefit of significantly enhanced physical characteristics.

Acid number is a measure of the amount of carboxylic acid groups in a chemical compound. Acid functionality is usually imparted by addition of methacrylic or acrylic acid into the polymer backbone. The polarity of the carboxylic acid functional group is useful in improving pigment wetting and can also improve adhesion to substrates such as metals or glass. The acid functionality can be reacted with epoxy resins to improve chemical resistance, adhesion, and toughness of the polymer. Some carboxyl functional acrylic polymers can be neutralized with amines to become water-reducible, allowing additional versatility for use in either solvent-based or water-based coatings.

Hydroxyl number is a measure of the hydroxyl content of a polymer. Incorporating hydroxyl groups into the polymer backbone allows them to be reacted with melamines, ureas, or isocyanates and form a crosslinked structure that significantly increases molecular weight of the cured film. In turn, the higher molecular weight of the cured film greatly improves its chemical resistance, weathering, and toughness.

Commercial Grades

EMA Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Comments
BR-90	71	190	0	18,200	Hard, relatively flexible and high in alcohol tolerance
BR-220	59	65	9	1,070	Resin with excellent alcohol solubility

iBMA Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Comments
BR-101	60	140	0	810	Relatively hard. Soluble in aliphatic and alcohol solvents
BR-115	55	55	0	130	Compatibility with long and medium oil alkyd resins and weak solvents
MB-7022	51	20	0	40	Low molecular weight resin giving improved adhesion to reactive cure systems

Unique Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Comments
MB-2594	60	7	6	20	Acid functional, ultra low Mw resin for pigment dispersion
MB-2595	59	8	0	25	Amine functional, ultra low Mw resin for pigment dispersion
MB-2678	64	140	0	1,880	Tough hydrophobic resin
MB-7303	56	50	0	180	Epoxy functional acrylic resin
TB-043	53	60	3	260	A novel resin for low VOC coatings
TB-044	53	60	3	250	A low VOC resin with enhanced solubility in low Kb solvents

MMA Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Comments
BR-73	97	80	3	3,400	Very hard coating resin with improved solubility, flexibility, adhesion and pigment dispersion
BR-78	82	75	10	10,500	Very hard coating resin with better water resistance
BR-80	105	95	0	24,000	The hardest in our BR series, tough with excellent durability and weather resistance
BR-87	105	25	9	1,300	Hard higher acid resin excellent for improved pigment dispersion
BR-113	78	30	3	300	Hard general purpose coating resin
BR-121DA	56	90	8	2,230	Resin with excellent adhesion to metal (Not REACH listed)
MB-2519	105	73	7	14,400	Low profile additive for SMC/BMC
MB-2660	70	65	4	810	Alcohol resistant resin, good adhesion to plastics
MB-2823	74	22	0	210	Good compatibility with short oil alkyds
MB-7033	88	78	0	1150	High abrasion resistant resin for plastic coatings

Commercial Grades

BMA Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Comments
BR-106	58	60	3	335	General purpose grade. Acid content improves adhesion and pigment dispersion
BR-107	60	65	0	335	Moderately hard and flexible, soluble in a range of solvents
BR-116	60	50	6	370	Coating resin with improved pigment dispersion
MB-2543	58	35	3	140	High solids, low VOC general purpose resin
MB-2588	49	120	15	2,370	Softer, more flexible coating resin and soluble in weak solvents
MB-2766	52	190	9	12,100	High MW coating resin
MB-2777	54	170	9	6,650	High MW coating resin
MB-7017	59	45	3	200	Medium molecular weight general coating resin

Styrene Acrylic Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Comments
BR-53	59	64	6	350	Excellent humidity and water resistance
BR-57	61	45	6	206	Resin for higher solid coatings
MB-2998	74	42	13	330	Harder styrene acrylic resin

High Acid Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ³	Comments
PB-204	76	9	55	20	A low Mw, high acid number resin
PB-383	55	30	176	600	Higher Mw acid functional resin
PB-588	50	90	45	225	Highest Mw resin

Hydroxyl Resins

Resin	T _g °C	Mw (x1000)	Acid Value ¹	Viscosity (Cps) ²	Hydroxy Number ⁴	Comments
MB-2752	67	17	7	800	90	Highest OH value for 2K coatings
MB-2876	83	30	5	275	8	Higher toughness, lower viscosity resin
MB-2935	82	22	5	340	8	Hydroxyl functional
MB-3068	51	41	5	225	8	Softer hydroxyl functional resin

¹ Acid values as mgKOH/gr on 100% solid resin

² All values measured at 40% solids in toluene @ 25°C

³ All values measured at 30% solids in Ethyl Acetate @ 25°C

⁴ Value assumes total incorporation of functional monomer as mgKOH/gr on 100% solid resin

Resin Selection Guide

Application	Product				
Adhesives	PB-204	BR-80	MB-2766	BR-101	BR-90
Aerosol paints	BR-101	BR-106	BR-115	MB-2543	MB-7022
Alkyd modifiers	BR-106	BR-115	MB-2823	BR-121DA	
Anaerobic adhesives	BR-80	BR-78			
Architectural coatings	BR-106	BR-53	BR-57		
Automotive coatings	BR-106	BR-90	MB-2543		
Automotive sanding primers	BR-121DA				
Beer labels	BR-57	MB-2998			
BMC/SMC	BR-80	MB-2519	BR-78		
Brass lacquers	BR-121DA	MB-2752	BR-113		
Coffins/caskets coatings	MB-2660	BR-113	MB-2766		
Concrete cure and sealers	BR-106	BR-53	BR-57	MB-2543	
Container coatings	BR-116	BR-106	BR-113		
Floor coatings	BR-106	BR-73	BR-113	BR-101	
Frosted glass look	BR-106	BR-113			
Gravure and flexo inks	MB-2543	BR-106	BR-73		
Heat seal coatings	BR-106	MB-2543			
Industrial coatings	BR-106	MB-2594	MB-2660	MB-2752	BR-121DA
Industrial staple cement	MB-2543	MB-2588			
Inks	BR-80	BR-115	BR-220	MB-2543	BR-106
Ink jet inks	PB-204	BR-220			
Lacquers	BR-113	BR-106			
Low profile additives	MB-2519	BR-78			
Low VOC coatings	MB-2543	TB-043			
Marine coatings	BR-116	BR-106	MB-2876		
Marker inks	BR-220	TB-043			
Metal coatings	BR-106	BR-121DA	MB-7303		
Metalizing paper and film coatings	MB-2823	MB-7017	BR-87	BR-57	MB-2998
Pigment dispersants	MB-2594	MB-2595			
Plastic coatings	BR-106	BR-113	MB-7017		
Plastic coatings - electronic appliances	BR-101	BR-115	MB-2588		
Pool coatings	BR-53	BR-57	BR-121DA		
PVC coatings	BR-73	BR-78			
PVC leather coatings	BR-115	BR-73	BR-106	BR-80	BR-87
Reactive hot melt adhesives	MB-2876	MB-2935	MB-3068		
Screen inks	BR-106	BR-115	MB-2594	BR-220	
Shrink wrap coatings	MB-2660	MB-2678			
Solid surface adhesives	BR-78				
Stencil inks	BR-116	BR-220			
Temporary ceramic binders	BR-101	BR-115			
Traffic paints	BR-106	BR-116			
Urethane acrylic coatings	MB-2752	MB-2876	MB-3068	MB-2935	
UV cured adhesives	MB-2543	MB-7303			
UV inks	BR-220	MB-2543	MB-7022	BR-113	
Weak solvents	BR-115	BR-101	MB-2588	MB-7022	TB-044
Wood coatings	BR-106	BR-113	TB-043		

Quality Policy

Dianal America, Inc. is dedicated to providing products that meet or exceed our customer's needs and requirements in order to promote our mutual growth and prosperity. We believe in the value and contributions of our employees, and encourage their professional growth. All Dianal personnel participate in the continual improvement and effectiveness of the quality management system through our use of objectives to measure the performance of the quality management system.

Handling Procedures for Acrylic Resins

Under normal conditions of use, DAI acrylic resins present no significant hazards to health, safety or the environment.

Please consult the MSDS for specific information for each product prior to use.

Some general handling guidelines are given below to minimize any potential risk:

- DAI acrylic resins are often dissolved in flammable organic solvents; care should be taken to eliminate the potential for a fire hazard. Be sure to have adequate work space ventilation to remove solvent vapor.
- Electrical static discharge is a potential hazard when flammable solvents are used. To prevent static electricity, containers must be grounded whenever solvent is transferred between containers and/or mixers. Explosion-proof motors and non-sparking tools should be used in areas where resin solutions are prepared or handled.
- Nonconductive solids can present a static discharge danger when added to flammable liquids. Be certain to ground both the mixing containers and the product during transfers.
- Particles in the eye should be removed by copious flushing with clean water.
- Bead resins are small and spherical in shape; they can present a slipping hazard if spilled. Spills should be cleaned up promptly.
- Bead resins can be stored for extended periods at room temperature. Keep packages sealed, cool and dry.



Aerial view of Dianal's facility and the surrounding Galveston Bay area

Viscosity Conversion Table

Centipoise	Gardner Holdt Bubble	Krebs- Stormer KU	Saybolt Universal SSU	Ford Cup 3	Ford Cup 4	Zahn Cup 1	Zahn Cup 2	Zahn Cup 3	Zahn Cup 4	Zahn Cup 5
10	A4		60		5	30	16			
15	A3		80		8	34	17			
25	A2		130	15	12	41	19			
30	A1		160	19	14	44	20			
40	A		210	25	18	52	22			
60	B	33	320	33	25	68	27			
80	C	37	430	41	31		34			
100	D	40	530	50	34		41	12	10	
120	E	43	580	58	41		49	14	11	
140	F	46	690	66	45		58	16	13	
160	G	48	790		50		66	18	14	
200	H	52	1,000		58		82	23	17	10
220	I	54	1,100		62			25	18	11
240	J	56	1,200		65			28	20	12
280	K	59	1,380		70			32	22	14
300	L	60	1,475		74			34	24	15
320	M		1,530					36	25	16
340	N		1,630					39	26	17
360	O	62	1,730					41	28	18
400	P	64	1,950					46	30	20
440	Q		2,160					50	33	22
460	R	66	2,270					52	34	23
500	S	68	2,480					57	37	25
550	T	69	2,660					63	40	27
600	U	71	2,900					68	44	30
900	V	81	4,300						64	45
1,000	W	85	4,600							49
1,300	X	95	6,100							64
1,700	Y	101	8,000							
2,300	Z	105	10,750							
2,500	Z1	114	11,600							
3,500	Z2	129	16,500							
4,500	Z3	136	21,000							
6,000	Z4		28,000							
10,000	Z5		46,500							
15,000	Z6		69,500							

All viscosities based on measurements taken at 25°C



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