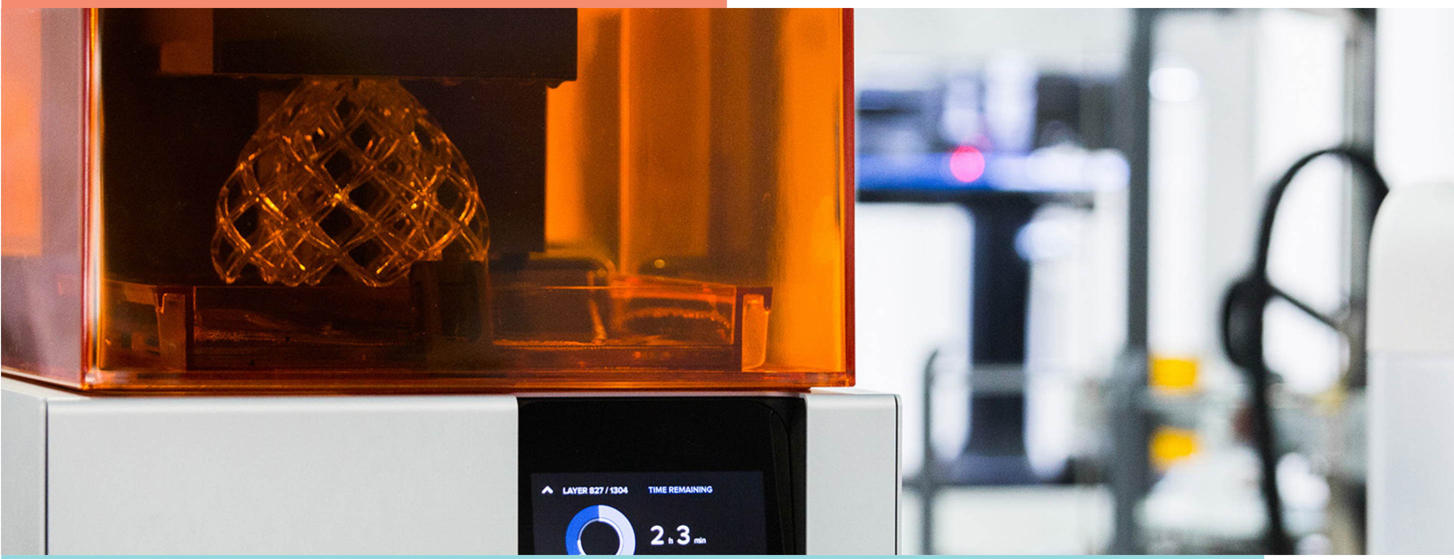
Oligomers for 3D Printing Inks & Resins



Formulate 3D Printing Inks with Superior Mechanical Properties & Surface Quality

As the 3D printing industry continues to grow at a faster rate than ever, manufacturers are striving to create new, higher quality printing materials that overcome problems with deformation, have superior surface quality, and provide better mechanical properties. Addressing these problems will allow 3D printing to be used not only for rapid prototyping but also for rapid manufacturing of final products.

Bomar® offers a selection of oligomers that are ideal for formulating printing inks and resins for SLA, DLP, and 3D inkjet printers. The selection consists of oligomers with varying Tgs that allow for flexibility in mechanical properties. Formulators looking to eliminate object deformation can select an oligomer with a high Tg and low linear shrinkage. The oligomers also cover a large range of viscosities so formulators can achieve the flow characteristics they desire.

In addition to the mechanical properties these oligomers provide, they also are non–yellowing for higher clarity and offer color stability for better looking objects. Formulations using Bomar oligomers also gain high impact resistance, making them more durable against dropping and every day wear. If one of our existing oligomers do not provide the desired properties for your application, Bomar can work with you to develop a custom oligomer. We also offer a range of scale up and manufacturing services.

- Ideal for inks used in stereolithography (SLA), digital light processing (DLP), and 3D inkjet applications
- Excellent mechanical properties for products that can be used in applications beyond prototyping
- Superior surface quality and deformation resistance for better aesthetics
- High impact resistance for more durable products
- Variety of viscosities for desired flow characteristics

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OLIGOMER PROPERTIES

Oligomers with varying degrees of flexibility were tested for potential 3D printing applications using a simple model formula. Most formulations were cured on a Dymax UVCS conveyor using two 5000–EC flood lamps outfitted with metal–halide bulbs. Curing was completed with an intensity of 300 mW/cm^2 and 4,000 mJ/cm^2 energy at a speed of 3 ft. per minute. The curing intensity was recorded using an ACCU–CAL™ 150 radiometer. A summary of the test results can be found below.

Formula		
45% Oligomer	51% Monomer	4% photoinitiator

Product	Viscosity (cP) ASTM D4287	Durometer Hardness (D) ASTM D2240	Tensile Strength (psi)*** ASTM D638	Elongation at Break (%) ASTM D638	Modulus (ksi) ASTM D638	Glass Transition Temperature (ºC)	Heat Distortion Temperature (ºC) at 66 psi ASTM D648	Linear Shrinkage (%) ASTM D2556	% Water Absorption ASTM D570
BR-144B*	950	87	5020	3	105	118	70	0.7	0.22
BR-345	860	29	2040	550	20	87	36	0.8	0.48
BR-741	1010	89	4150	2	130	131	110	0.6	0.16
BR-930D**	600	87	6000	3.2	110	119	110	0.64	0.18
BR-970BT	170	82	7210	6	100	85	74	0.4	0.18
BR-970H	200	86	5930	5.5	207	117	107	0.7	0.15

* Because of the higher functionality of this oligomer, the curing procedure was adjusted to accommodate its faster cure. Testing on BR–144B was completed using a Dymax UVCS conveyor with one 5000–EC flood lamp outfitted with a metal–halide bulb at a speed of 5 ft. per minute.

** Model formula was adjusted to reflect the monomer in BR–930D.

*** Tensile strength testing was completed using a Dymax 2000–EC flood lamp outfitted with a metal–halide bulb.

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