

The Element of INNOVATION

Bringing Together Chemicals, Materials, Technology & Processes for 3D Printing



Mitsubishi Chemical

Mitsubishi Chemical Corporation has the global organization and infrastructure to leverage local and global synergies through the vast network of affiliated companies. With over 40.000 employees at 358 affiliates in 30 different countries, Mitsubishi Chemical brings **The Element of INNOVATION** to materials for 3D printing.

The quickly changing 3D market needs strong global partners that have a sustained commitment to the Industry. Mitsubishi Chemical is a truly global technology and manufacturing company and our extensive knowledge in Chemical Science, together with our long-term strategy of further investments in 3D printing, position us well to be a lasting partner in the 3D printing market.

Thanks to the intensified collaboration and experience, Mitsubishi Chemical group companies are uniquely positioned to meet the changing demand of key industries including automotive, aerospace, medical, packaging, building and construction and many others. Many key industries that have highly advanced conventional production methodologies have added 3D printing capabilities to prototype and manufacture more efficiently. Our extensive state-of-the-art material technology portfolio and chemical expertise makes Mitsubishi Chemical the ideal partner for developing custom solutions.

Group Companies of Mitsubishi Chemical with material solutions for 3D Printing



The sustainable well-being of people, society and our planet Earth –
we call it KAITEKI.

Through our core values of Sustainability, Health and Comfort,
we create innovative solutions globally realizing KAITEKI.

Creating KAITEKI Value today, we ensure a bright future for tomorrow.

We are THE KAITEKI COMPANY.

KAITEKI Value for Tomorrow

High quality polymer based filaments and compounds for 3D printing

MCPP is one of the world's largest polymer-based 3D filament manufacturers, with a focus on high quality filaments and the development of new innovative materials for FDM and/or FGF 3D printing. Our labs achieve optimal results by focusing on creating the perfect settings for the combination of hardware and software for each material. As your partner, we help you create a unique filament range, manufactured to your specifications through our toll manufacturing services, and deliver product ready to be sold in your own customized packaging.

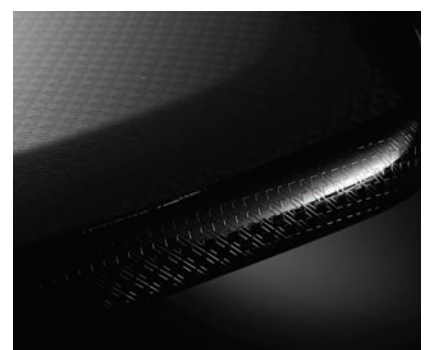
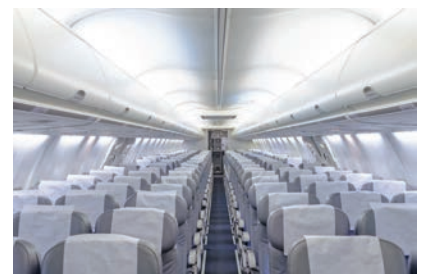
Product	Features	Colors
PLA		
PLA	Tougher than regular PLA, biodegradable	33
PLA Matte	Aesthetic matte effect, low light refraction and creates a rough feeling	3
Satin	Silky feeling, stunning pearlescent shine, easy to print and low warping	12
PLA Glitter	Beautiful sparkling effect that helps conceal layers	6
PLA-X ³	Engineered for high speed printing, high mechanical strength and high temperature resistance	6
TPLA	Changes color from gray to natural > 33°C and low warping	1
MT-Copper	Copper filled 80%, 3 x heavier than PLA and easy polishing	1
MT-Bronze	Bronze filled 80%, 3 x heavier than PLA and easy polishing	1
MT-Brass	Brass filled 80%, 2 x heavier than PLA and cold touch	1
Wood	Feels and smells like wood, biodegradable and low warping	5
Styrene		
ABS	Very high impact-resistance and stable printing	26
ABS-X	Great strength & aesthetics, zero warp technology and high impact-resistance	12
ASA-X	UV / Weather resistant, zero warp technology and excellent interlayer adhesion	7
HIPS	Matte finish building material, easy to glue and dissolves in D'Limonene	6
M-ABS	Translucent options, low warping, limited smell and compared to regular ABS	12
PC-ABS	Interlayer adhesion, high impact resistance and high surface gloss	2
PC-ABS VO	Flame retardant (UL-94 V0), halogen free	1
(Co)Polyester		
PET-G	High clarity, very tough, easy to print, odor neutral and FCA	19
Carbon-P	Carbon fiber filled PET-G, extremely stiff, increased impact and matte surface	1
PC	Great strength & stiffness, high optical clarity and low flammability (UL-94 V2)	1

Product	Features	Colors
Flexible		
Glassbend	92% Light transmission, strong, flexible FCA	1
FLEX 45	Very flexible, strong, long term heat resistant and UV resistant	5
TPU98A	Strong & flexible, for direct & bowden tube, shore 698A and FCA	6
Polyamide		
PA-CX12	High-performance industrial grade nylon, strong & flexible, crack & scratch resistance, superior chemical and UV resistance	3
Polyolefin		
PP	General purpose, excellent fatigue resistance, chemical resistance, microwave and dishwasher safe and FCA	3
Support		
PVA	Water soluble support material, excellent bonding to PLA	1
PVA-M	Like PVA, better bonding to various filaments and excellent for PET-G	1
PVA-S	Increased heat stable water soluble filament with excellent adhesion to ABS, ABS-X, ASA-X, PLA-X ³ and TPU98A	1
Partner Materials		
ONE PET	100% recycled PET -A, strong & stiff, excellent layer adhesion	7
ARNITEL® ID2060 HT	A unique balance of flexibility, sustained high temperature and chemical resistance	1
ARNITEL® ID2045	100% recyclable (50% bio-based feedstock), easy and fast printing, high performance, excellent inter-layer adhesion	3
NOVAMID® ID1030 CF10	Durable parts, good mechanical properties due to high inter-layer strength, 10% carbon loading	1
NOVAMID® ID1070	Optimized crystallization profile improves fusion. Excellent interlayer strength, high surface quality.	2
ARNITE® ID3040	Open source PET filament, good fusion & interlayer strength with great surface qualities	2
NOVAMID® ID1030	Strong, ductile and easy to print. Based on PA6/66	4
ULTRA DIAMOND	Extremely rigid (6300 MPa), nonabrasive and non hygroscopic, fast printing, low print temp (~230°C) and very smooth surface	3
PLACTIVE AN ¹	Antibacterial action, eliminating more than 99.99% of fungi, viruses, bacteria and a wide range of microorganisms	3

Mitsubishi Chemical's DURABIO™ bio-based material is a truly durable engineering plastic that is made from isosorbide (derived from sorbitol), a widely available feedstock. In addition to being environmentally friendly, DURABIO™ material also combines most of the advantageous properties of Polycarbonate (PC) and those of the Polymethyl methacrylate (PMMA), creating an innovative renewable material with extraordinary properties.

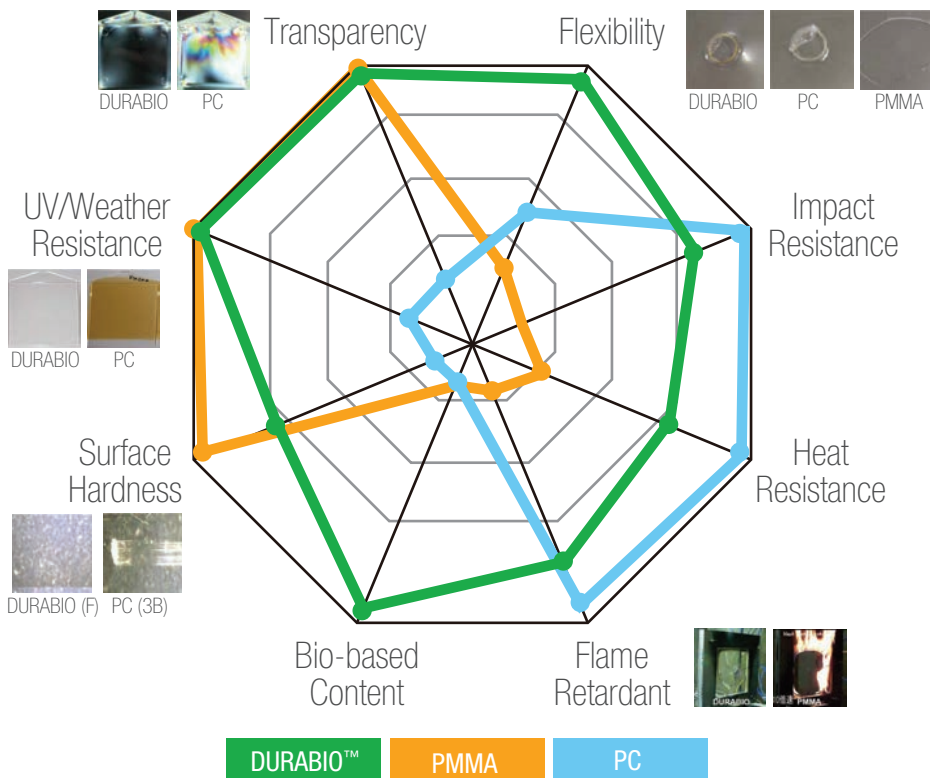
DURABIO™ is particularly designed for scratch and impact resistance applications requiring exceptional durable transparency and visual appearance, such as:

- Touch screen displays
- Optical features: high transparency, low birefringence
- Interior automotive console and IP trim: paintless decorative parts
- Exterior automotive grills, pillar panels and trim: paintless decorative parts
- Sporting equipment: crystal clear lenses
- Aerospace: light pipes inside the cabin



Product Features

- Partially bio-based - Made from renewable materials
- High surface impact strength
- UV/Weather resistant - Ensures long life of products, saving resources
- Paint-free/Coating-free finish - Reduction of VOCs, lower carbon foot-print as well as increased production efficiency
- Abrasion resistant - Ensures intact aesthetics over many years of usage
- High optical transmission - Used as glass replacement, further reducing product weight





BioPBS™ Truly Environmentally-friendly Plastic for Green Products

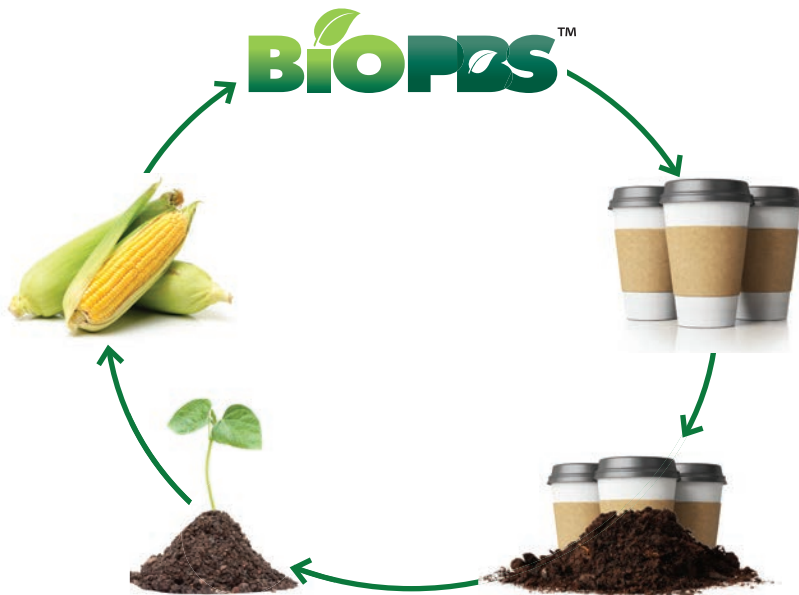
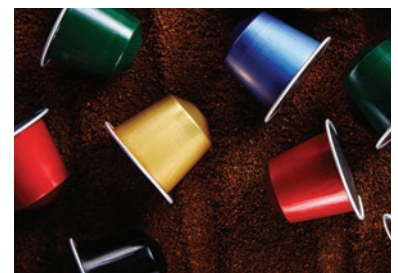
Mitsubishi Chemical (Japan's largest chemical company) and PTT (ASEAN's leader for production and distribution of chemicals, olefins, PE, PS, green chemicals and bioplastics) have partnered together to develop and patent an innovative bioplastic - BioPBS™. Derived from renewable material and known for superior ambient compostability, BioPBS™ is a truly environmentally-friendly plastic for green products.

BioPBS™ (partially bio-based polybutylene succinate) is revolutionary in its two-fold bio properties.

- Partially bio-based - Using advanced technology from Mitsubishi Chemical Corporation, it is both partially bio-based and biodegradable plastic.
- Compostable - Derived from natural resources, BioPBS™ is compostable into biomass, carbon dioxide and water. Products made from BioPBS™ can be disposed along with organic waste. BioPBS™ has no adverse effects on the environment and is naturally compostable, without requiring a specialized composting facility.

Product Features

- Bio-based - BP (Biomass Pla) 299/300, ASTM D6866, DIN Certco 8C084 / 8C085 / 8C083
- Compostable - BPI (certif. 10528580)
- High service temperature - Products can withstand up to 100°C.
- Food contact approved - FCS /FCN No.1817/1818
- High performance heat sealability - Same level of seal strength as conventional petro-plastic but achieved with lower temperature
- Compatible with natural fibers
- Excellent Processability
- Mutual compatibility with other biodegradable plastics such as PLA



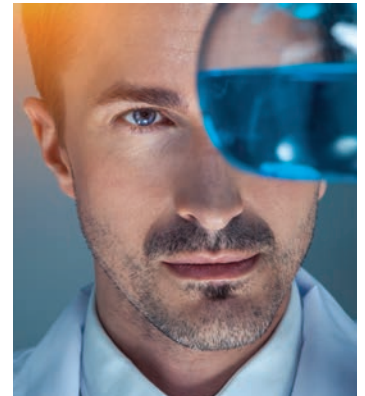
Certifications





Xantar™ Laser Direct Structuring Material

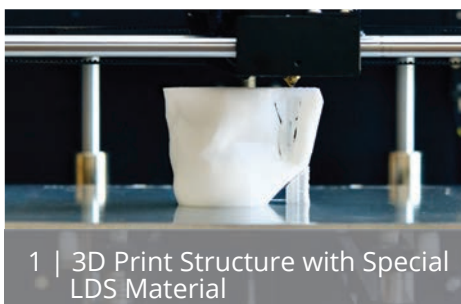
Laser Direct Structuring (LDS) is a simple and precise technology for producing 3D molded interconnect devices. LDS technology begins with a 3D part in which the interconnect pattern is directly activated by a laser. The conductive path is then created with conventional plating.



Mitsubishi Engineering-Plastics (MEP) has an LDS product range for injection molding consisting of PC and PC-Blends Iupilon™ and Xantar™, PBT Novaduran™ and our high performance polymer Reny™ PA-MXD6. These materials are then modified by doping with a laser additive and through mixing, compounding and granulation, result in specialty materials for Laser Direct Structuring.

Covering the entire temperature range, including the demanding reflow soldering at 260°C, MEP has the broadest material portfolio suitable for Laser Direct Structuring.

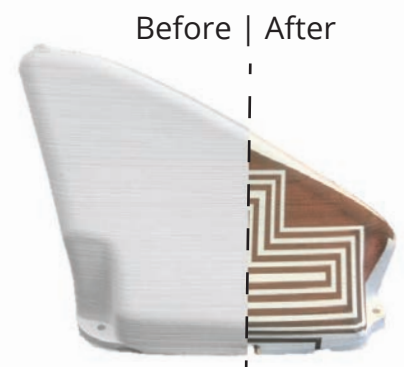
Products	Temp.	Applications
Iupilon™ Xantar™ PC, PC/ABS	140°C	Smartphones Antennas Tablet Antennas RFID Antennas Ultrabook Antennas Automotive Antennas
Reny™ PA-MXD6	260°C	Connectors SMT Antennas Sensors 1, 2 Layer PCBs LED Package & Module Reflow Resistant Labeling Miniaturized E-motors Auto Steering Wheels



MEP has extended their line of Xantar LDS Material to include filaments for 3D printing. Realizing the opportunity to expedite developments from prototyping to mass production, MEP has optimized these filaments to utilize LDS technology, allowing parts to include printed electrical circuitry.

3D LDS Technology Advantages

- Faster development timeline from prototyping to mass production
- High design flexibility and integration of circuits on a structural part
- Suitable for small sized curved surfaces and low wall thickness
- Rapid prototyping with LDS grades
- Good lasering and plating performance of printed parts
- Printed parts show the same RF performance as injection molded parts





3Diakon™ PMMA Filament

Diakon™ polymers from Lucite International are known for their easy processability, excellent optical clarity, high light transmission, toughness and high scratch and impact resistance. They have been used for many years extensively for the smartphone screens as well as the electrical equipment displays and infra red transmitter/receiver windows.

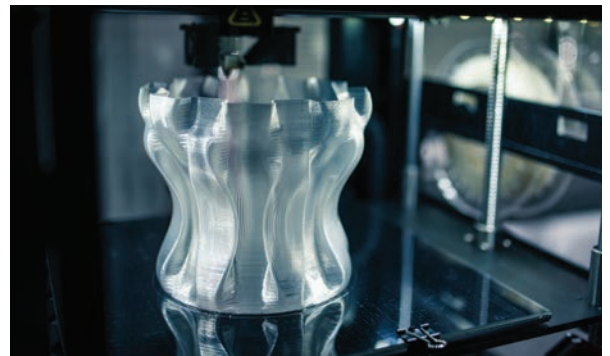


Transparent 3Diakon™ after polishing

With collaboration with Lucite International, MCPP has now taken this well-known material and developed 3Diakon™ - a transparent 3D printable polymethyl methacrylate (PMMA) filament. 3Diakon™ has excellent weathering and UV stability combined with excellent impact performance and stiffness.

Product Features

- Strong, lightweight and rigid material
- High impact and abrasion resistance
- Ease of printing
- Transparent and glossy after sanding post processing - Ideal for lighting applications
- UV resistance stability and excellent resistance to weathering - ideal for outdoor use applications



Freeform Injection Molding with Advanced Materials

Freeform Injection Molding (FIM) is a proprietary hybrid additive manufacturing solution that blends the best of additive manufacturing and injection molding technologies. The process is completed in 3 easy steps:

CREATE the injection mold cavity insert by 3D printing on the proprietary AddiFab™ system.

INJECT your preferred high performance MCC advanced materials into the cavity insert with Babyplast™ injection molding machine.

REMOVE the 3D printed cavity insert, revealing a complex, isotropic part.

With the collaboration of MCC, AddiFab and ALBA, we now have the ability to bring generative design to our entire injection molding portfolio as a ready-to-use solution for our customers. FIM is the first technology to yield data sheet injection molding mechanical strengths for KyronMAX™ and all MCC polymers. This opens new possibilities for design engineers total life-cycle management to integrate new components into industrial applications, seamless integration across rapid prototyping, mass customization, volume production and after-market parts.



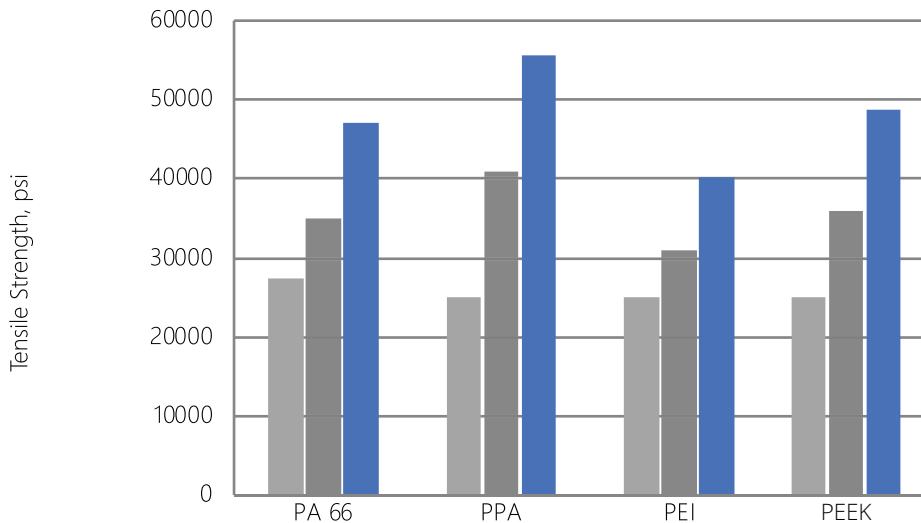


KyronMAX™ High Performance Carbon Fiber Composites

Mitsubishi Chemical Advanced Material's Kyron® high performance polymers offer a range of properties engineered to maximize chemical and thermal resistance and provide mechanical endurance at extreme temperatures and pressures. Kyron® engineered polymers bring unparalleled performance to critical components where success is the only option. Bringing together our proprietary molding technology with the Kyron® state-of-the-art material technology, we have created the KyronMAX™ series of high performance carbon fiber composite materials - the strongest injection moldable polymers available today.

Product Features

- Tensile strength - True metal replacement mechanical properties (including aluminum, magnesium and in many cases steel)
- Weight - 40% lighter than aluminum and 75% lighter than steel
- Higher product performance due to better knit line strength - Lower filler levels reduce the knit line effect and increase the strength of the part.
- Better "practical toughness" due to lower filler loadings - Lower filler content increases the material's elongation at yield which results in the ability for the part to yield and not fracture.
- Lower filler loadings than traditional thermoplastic compounds - Lower filler levels promote a larger processing window, reducing weight.



	PA 66	PPA	PEI	PEEK
■ 30% Glass Fiber	27500	25100	25100	25000
■ 30% Carbon Fiber	35000	41000	31000	36000
■ 30% KyronMax Fiber	47200	55600	40300	48700

	KyronMAX S Series	KyronMAX ES Series
Tensile Strength	Up to 50,000 psi/ (345 MPa)	50,000 - 75,000 psi/ (345 - 517 MPa)
Tensile Modulus	Up to 5 million psi/ (35 GPa)	5 - 8 million psi/ (35 - 55 GPa)
Fillers	MAX Fibers	MAX Fibers, Glass, Carbon
Polymers	PEEK, PPS, PEI, PPA, PA	PEEK, PPA
Metal Replacement	Aluminum, Cast iron, Magnesium	Steel, Aluminum, Cast iron, Magnesium

