

Алматы (7273)495-231  
Ангарск (3955)60-70-56  
Архангельск (8182)63-90-72  
Астрахань (8512)99-46-04  
Барнаул (3852)73-04-60  
Белгород (4722)40-23-64  
Благовещенск (4162)22-76-07  
Брянск (4832)59-03-52  
Владивосток (423)249-28-31  
Владикавказ (8672)28-90-48  
Владимир (4922)49-43-18  
Волгоград (844)278-03-48  
Вологда (8172)26-41-59  
Воронеж (473)204-51-73  
Екатеринбург (343)384-55-89

Иваново (4932)77-34-06  
Ижевск (3412)26-03-58  
Иркутск (395)279-98-46  
Казань (843)206-01-48  
Калининград (4012)72-03-81  
Калуга (4842)92-23-67  
Кемерово (3842)65-04-62  
Киров (8332)68-02-04  
Коломна (4966)23-41-49  
Кострома (4942)77-07-48  
Краснодар (861)203-40-90  
Красноярск (391)204-63-61  
Курск (4712)77-13-04  
Курган (3522)50-90-47  
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13  
Москва (495)268-04-70  
Мурманск (8152)59-64-93  
Набережные Челны (8552)20-53-41  
Нижний Новгород (831)429-08-12  
Новокузнецк (3843)20-46-81  
Ноябрьск (3496)41-32-12  
Новосибирск (383)227-86-73  
Омск (3812)21-46-40  
Орел (4862)44-53-42  
Оренбург (3532)37-68-04  
Пенза (8412)22-31-16  
Петрозаводск (8142)55-98-37  
Псков (8112)59-10-37

Пермь (342)205-81-47  
Ростов-на-Дону (863)308-18-15  
Рязань (4912)46-61-64  
Самара (846)206-03-16  
Саранск (8342)22-96-24  
Санкт-Петербург (812)309-46-40  
Саратов (845)249-38-78  
Севастополь (8692)22-31-93  
Симферополь (3652)67-13-56  
Смоленск (4812)29-41-54  
Сочи (862)225-72-31  
Ставрополь (8652)20-65-13  
Сургут (3462)77-98-35  
Сыктывкар (8212)25-95-17  
Тамбов (4752)50-40-97

Тверь (4822)63-31-35  
Тольятти (8482)63-91-07  
Томск (3822)98-41-53  
Тула (4872)33-79-87  
Тюмень (3452)66-21-18  
Ульяновск (8422)24-23-59  
Улан-Удэ (3012)59-97-51  
Уфа (347)229-48-12  
Хабаровск (4212)92-98-04  
Чебоксары (8352)28-53-07  
Челябинск (351)202-03-61  
Череповец (8202)49-02-64  
Чита (3022)38-34-83  
Якутск (4112)23-90-97  
Ярославль (4852)69-52-93

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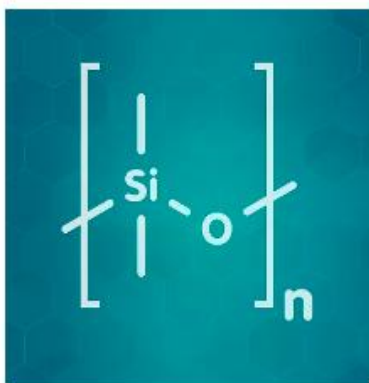
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# Технические характеристики на силиконовые материалы, специальные и умные полимеры, печатные электронные материалы, жидкие кристаллы компании **Sigma-Aldrich**

**Виды товаров:** силиконовые сополимеры и гомополимеры, силиконовые масла, специальные и интеллектуальные полимеры, терморективные и термопластичные полимеры, фотоотверждаемые смолы, эпоксидные смолы и полимерные нити для 3D-печати, чернила для струйной печати, трафаретной печати, аэрозольной печати и покрытия лезвий и др.

# Silicone Materials



## SILICONES

Silicones, also known as polysiloxanes, are synthetic polymers with a silicon-oxygen backbone like that in silicon dioxide but containing additional organic groups. Unlike homologous carbon-based polymers, these compounds show a unique combination of physical and chemical properties due to the exceptional physicochemical properties of the siloxane (-Si-O-) bond. Silicone-containing copolymers and silicone-modified networks have extremely high backbone flexibility and very low glass transition temperatures ( $T_g$ ), around  $-120\text{ }^\circ\text{C}$ . They also demonstrate good thermal and oxidative stability, high gas permeability, excellent dielectric properties, biocompatibility, and minimal surface tension.

Read more about

- **Classification of Silicones**
- **Silicone Copolymers and Homopolymers**
- **Silicone Oils**

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## CLASSIFICATION OF SILICONES

Our silicone (polysiloxane) silicone polymers demonstrate a variety of silicone material properties and can be categorized as fluids, elastomers, or resins. Polymers of moderate molecular weight are classified as fluids, while slightly cross-linked polymers with high molecular weight are elastomeric. Low molecular weight resins contain functional groups, usually hydroxyl, alkoxy, or chloro groups, that undergo hydrolysis and/or condensation to form highly cross-linked structures.

Common silicone material science applications of our basic products include:

- Silicone elastomers, such as polydimethylsiloxane (PDMS), for patterned stamps in soft lithography and nano-patterning applications
- Dielectric materials for electrostatic actuators and dielectric energy harvesters
- Encapsulation and packaging materials for electronic devices
- Surface property modifying reagents for microfluidic applications

## SILICONE COPOLYMERS AND HOMOPOLYMERS

Silicone co- and homopolymers form a hydrophobic surface with low water uptake and are primarily used in the preparation of lubricants, foams, and polymeric adhesives.

Silicones in our catalog have:

- Non-reactive substitutes that tune the mechanical and thermal-mechanical properties (such as glass transition temperature)
- Reactive substitutes and terminal groups to allow chemical modification (such as crosslinking)
- Varying molecular weights and viscosity levels.

## SILICONE OILS

Our catalog includes silicone oils (or silicone fluids) which are any liquid polymerized siloxane having organic side chains. They are more thermodynamically stable than other siloxanes due to a highly polarized Si-O-Si bond with a large bond energy. Silicone fluids exhibit greater structural flexibility, permeability, and lubricity due to freely rotating methyl groups as well as weak intermolecular attractive forces. Furthermore, they have excellent wetting and film-forming properties due to lower surface tension and are odorless, non-toxic, water-repellent, chemical-resistant, and UV-resistant.

We offer a wide range of silicone oils with various degrees of viscosity, spanning from 5 c St (or 5 mPa·s) to 100,000 c St (or 100,000 mPa·s) at 25 °C. Our silicone oils can be used as heating and cooling fluids in thermal management. When used in water/oil systems, our siloxanes generate stable emulsions of microdroplets which are widely used in DNA and blood analysis, chemical reactions, drug discovery, ink formulations, cosmetics, textiles, and home care products.

534463

**1,3,5,7,9,11,14-Heptaisobutyltricyclo[7.3.3.1<sup>5,11</sup>]heptasiloxane-endo-3,7,14-triol**

97%



420719

**Lithium polysilicate solution**

20 wt. % in H<sub>2</sub>O



522260

**PSS hydrate-Octakis(tetramethylammonium) substituted**



560316

**PSS-[2-(3,4-Epoxy cyclohexyl)ethyl]-Heptaisobutyl substituted**



560294

**PSS-[3-(2-Aminoethyl)amino]propyl-Heptaisobutyl substituted**



534633

**PSS-(1-Propylmethacrylate)-Heptaisobutyl substituted**

560286  
**PSS-(2-(*trans*-3,4-Cyclohexanediol)ethyl)-Heptaisobutyl substituted**

560308  
**PSS-(2,3-Propanediol)propoxy-Heptaisobutyl substituted**

560324  
**PSS-(3-Glycidyl)propoxy-Heptaisobutyl substituted**

560375  
**PSS-(3-Mercapto)propyl-Heptaisobutyl substituted**

468592  
**PSS-Allyl-Heptacyclopentyl substituted**

593869  
**PSS-Octa[(3-glycidyloxypropyl)dimethylsiloxy] substituted**

476544  
**PSS-Octakis(dimethylsilyloxy) substituted**

526835  
**PSS-Octamethyl substituted**

526851  
**PSS-Octaphenyl substituted**

475424  
**PSS-Octavinyl substituted**

560391  
**PSS-Trisilanol-isoctyl substituted**

560367  
**PSS-Vinyl-Heptaisobutyl substituted**

85409  
**Silicone oil**  
for oil baths (from -50°C to +200°C)

175633

**Silicone oil**

high temperature

378364

**Silicone oil**

viscosity 100 cSt (25 °C)



378380

**Silicone oil**

viscosity 500 cSt (25 °C)



378348

**Silicone oil**

viscosity 20 cSt (25 °C)



378402

**Silicone oil**

viscosity 10,000 cSt (25 °C)



378321

**Silicone oil**

viscosity 10 cSt (25 °C)



378356

**Silicone oil**

viscosity 50 cSt (25 °C)



378437

**Silicone oil**

viscosity 100,000 cSt (25 °C)



378372

**Silicone oil**

viscosity 350 cSt (25 °C)



317667

**Silicone oil**

viscosity 5 cSt (25 °C)



378429

**Silicone oil**

viscosity 30,000 cSt (25 °C)



181838

**Silicone oil**

Dow Corning 200® fluid, viscosity 60,000 cSt (25 °C)



378399

**Silicone oil**

viscosity 1,000 cSt (25 °C)



10838

**Silicone oil AP 100**

viscosity ~100 mPa.s, neat(25 °C)



10842

**Silicone oil AP 1000**

viscosity ~1000 mPa.s, neat(25 °C)



50384

**Silicone oil AP 150**

viscosity ~150 mPa.s, neat(25 °C)



10836

**Silicone oil AR 20**

viscosity ~20 mPa.s, neat(25 °C)



85419

**Silicone oil AR 200**

viscosity ~200 mPa.s, neat(25 °C)



805998

**SYLGARD® 170 silicone elastomer**

10 cc dual syringe with the static mixer



761036

**SYLGARD® 184**

10 g clip-pack



761028

**SYLGARD® 184**

5 g clip-pack

175587

**Tris(2-methoxyethoxy)(vinyl)silane**

98%

# Specialty & Smart Polymers



Specialty and smart polymer materials are suitable for engineering processes with exceptional mechanical properties, such as stiffness, toughness, tensile strength, and low creep. These polymers are ideal for structural applications such as gears, auto parts, the outer covering of electronic devices, and high-strength composites. For that, explore our thermosets, thermoplastics and 3D printing filaments.

## THERMOSETTING POLYMERS

Our thermosetting polymers, or thermosets, can be irreversibly hardened by curing and molding into the final shape. For these applications, we offer:

- Amide aromatic resins
- Bisphenol A polymers and epoxy prepolymer resins
- Formaldehyde copolymers and epoxies
- Photo-curable resins

## THERMOPLASTIC POLYMERS

Thermoplastic polymers have other unique properties, such as thermal processability allowing them to be reshaped at elevated temperatures. They are commonly used injection molding and extrusion. Thermoplastic polymers are also used to reinforce anisotropic composite materials that function as artificial muscles, or actuators, that reversibly contract, or rotate through external stimuli. Examples include:

- Polyurethanes and urethane precursors
- Waxes and oils
- Poly(phenylene oxide) thermoplastic resins
- Polysulfones

## 3D PRINTING POLYMER FILAMENTS

We provide a wide selection of 3D printing polymer filaments to accommodate your additive manufacturing applications. Fabricated for all types of 3D printing technologies, our polymers allow for quick printing, minimal nozzle clogging, and low warping for the rapid design, prototyping and manufacturing of your end products.

909890

**[1,1':4',1''-Terphenyl]-3,3''- dicarboxylic acid, 2,2'',4,4'',6,6''- hexamethyl-, 3,3''-dimethyl ester**

≥97%

- 909912  
**3arm-poly(lactide-co-glycolide)**  
average  $M_n$  38,000-60,000, lactide:glycolide 55:45
  
- 901662  
**3D Printing Graphite Ink**
  
- 909904  
**4arm-poly(lactide-co-glycolide)**  
average  $M_n$  38,000-60,000, lactide:glycolide 55:45
  
- 243248  
**Beeswax**  
refined
  
- 243221  
**Beeswax**  
bleached
  
- 923974  
**Bio-based Polyether Polyol**  
 $M_n$  900-1100 Da
  
- 923982  
**Bio-based Polyether Polyol**  
MN = 2600 - 2800 Dalton
  
- 923966  
**Bio-based Polyether Polyol**  
 $M_n$  1800-2200 Da
  
- 909882  
**Biotin-poly(ethylene glycol)-b-poly(lactide-co-glycolide)**  
PEG average  $M_n$  2,000, PLGA average  $M_n$  10,000, lactide:glycolide 50:50
  
- TRD3D0063  
**Caementum architectural 3D printing filament**  
concrete effect, diam. 1.75 mm
  
- 909858  
**Carboxylic acid-poly(ethylene glycol)-b-poly(lactide-co-glycolide)**  
PEG average  $M_n$  5,000, PLGA average  $M_n$  20,000, lactide:glycolide 50:50
  
- 243213



## **Carnauba wax No. 1 yellow**

refined



TRD3D0014

### **Ecogenius PLA 3D printing filament**

red race, diam. 1.75 mm



TRD3D0015

### **Ecogenius PLA 3D printing filament**

signal white, diam. 1.75 mm



TRD3D0011

### **Ecogenius PLA 3D printing filament**

industrial grey, diam. 1.75 mm



TRD3D0010

### **Ecogenius PLA 3D printing filament**

black hole, diam. 1.75 mm



TRD3D0012

### **Ecogenius PLA 3D printing filament**

natural, diam. 1.75 mm



TRD3D0013

### **Ecogenius PLA 3D printing filament**

neptune blue, diam. 1.75 mm



TRD3D0047

### **Flexability TPE-HP flexible3D printing filament**

signal white, diam. 1.75 mm

TRD3D0048

### **Flexability TPE-HP flexible3D printing filament**

black hole, diam. 1.75 mm



TRD3D0049

### **Flexability+ TPE-HP flexible3D printing filament**

signal white, diam. 1.75 mm



TRD3D0050

### **Flexability+ TPE-HP flexible3D printing filament**

black hole, diam. 1.75 mm



TRD3D0042

### **Flexmark 7 TPU flexible 3D printing filament**

signal white, diam. 1.75 mm



TRD3D0041

**Flexmark 7 TPU flexible 3D printing filament**

black hole, diam. 1.75 mm



TRD3D0044

**Flexmark 8 TPU flexible 3D printing filament**

signal white, diam. 1.75 mm



TRD3D0043

**Flexmark 8 TPU flexible 3D printing filament**

black hole, diam. 1.75 mm



TRD3D0045

**Flexmark 9 TPU flexible 3D printing filament**

black hole, diam. 1.75 mm



TRD3D0016

**Fusion PLA 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0018

**Fusion PLA 3D Printing Filament**

neptune blue, diam. 1.75 mm



TRD3D0017

**Fusion PLA 3D Printing Filament**

industrial grey, diam. 1.75 mm



TRD3D0019

**Fusion PLA 3D Printing Filament**

red race, diam. 1.75 mm



TRD3D0020

**Fusion PLA 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0037

**G-PET PETG 3D Printing Filament**

ruby variocolor, diam. 1.75 mm



TRD3D0035

**G-PET PETG 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0036

**G-PET PETG 3D Printing Filament**

azul variocolor, diam. 1.75 mm



TRD3D0034

**G-PET PETG 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0022

**Gonzales High Speed PLA 3D Printing Filament**

neptune blue, diam. 1.75 mm



TRD3D0023

**Gonzales High Speed PLA 3D Printing Filament**

red race, diam. 1.75 mm



TRD3D0024

**Gonzales High Speed PLA 3D Printing Filament**

signal white, diam. 1.75 mm

TRD3D0021

**Gonzales High Speed PLA 3D Printing Filament**

black hole, diam. 1.75 mm



469300

**Hexamethyldisiloxane**

viscosity 0.65 cSt (25 °C)



TRD3D0038

**HIRMA PMMA 3D Printing Filament**

transparent, diam. 1.75 mm



TRD3D0025

**Kyotoflex BioFlexible PLA 3D printing filament**

neptune blue, diam. 1.75 mm



933732

**Linear polyethylenimine-block-poly(ethylene glycol)**

PEG average  $M_n$  5,000, PEI average  $M_n$  5,000



933910

**Linear polyethylenimine-block-poly(ethylene glycol)**

PEG average  $M_n$  5,000, PEI average  $M_n$  30,000



430021

**Linseed Oil**



TRD3D0055

**Longchain Nylon 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0056

**Longchain Nylon 3D Printing Filament**

signal white, diam. 1.75 mm



913286

**Methoxypolyethylene epoxide**

PEG average  $M_n$  750



TRD3D0070

**Monumental Evolution architectural 3D printing filament**

marble effect, diam. 1.75 mm, suitable for outdoor



910813

**mPEG<sub>24</sub>-NHS**



909874

**N-Hydroxysuccinimide ester-poly(ethylene glycol)-b-poly(D,L lactide)**

PEG average  $M_n$  5,000, PDLA average  $M_n$  16,000



434671

**N,N'-Ethylenebis(stearamide)**

beads, <840  $\mu$ m



TRD3D0059

**P-LENE 4 polypropylene 3D printing filament**

signal white, diam. 1.75 mm



TRD3D0057

**P-LENE 4 polypropylene 3D printing filament**

black hole, diam. 1.75 mm



TRD3D0058

**P-LENE 4 polypropylene 3D printing filament**

natural, diam. 1.75 mm



TRD3D0028

**Performance ABS 3D Printing Filament**

industrial grey, diam. 1.75 mm



TRD3D0029

**Performance ABS 3D Printing Filament**

neptune blue, diam. 1.75 mm



TRD3D0027

**Performance ABS 3D Printing Filament**

black hole, diam. 1.75 mm

TRD3D0030

**Performance ABS 3D Printing Filament**

red race, diam. 1.75 mm



TRD3D0031

**Performance ABS 3D Printing Filament**

signal white, diam. 1.75 mm



346411

**Poly[1-[4-(3-carboxy-4-hydroxyphenylazo)benzenesulfonamido]-1,2-ethanediyl, sodium salt]**

technical grade



440965

**Poly(1,4-phenylene ether-ether-sulfone)**

pellets



181803

**Poly(2,6-dimethyl-1,4-phenylene oxide)**

analytical standard,  $M_w$  30,000 (Typical),  $M_n$  20,000 (Typical)



181781

**Poly(2,6-dimethyl-1,4-phenylene oxide)**

powder



405493

**Poly(Bisphenol A-co-epichlorohydrin), glycidyl end-capped**

average  $M_n$  ~377



405450

**Poly(Bisphenol A-co-epichlorohydrin), glycidyl end-capped**

average  $M_n$  ~1,075



378488

**Poly(dimethylsiloxane-co-methylphenylsiloxane)**

viscosity 125 cSt



378445

**Poly(dimethylsiloxane-co-methylphenylsiloxane)**

viscosity 50 cSt



378461

**Poly(dimethylsiloxane-co-methylphenylsiloxane)**

viscosity 500 cSt



469319

**Poly(dimethylsiloxane)**

viscosity 1.0 cSt (25 °C)



481939

**Poly(dimethylsiloxane), hydroxy terminated**

average  $M_n$  ~550, viscosity ~25 cSt



909149

**Poly(ethylene glycol) diamine**

average  $M_n$  400



767565

**Poly(ethylene glycol) methyl ether amine**

average  $M_n$  500



911410

**Poly(ethylene glycol) methyl ether-block-poly(lactide-co-glycolide)**

PEG average  $M_n$  5,000, PLGA average  $M_n$  10,000, lactide:glycolide 80:20



911429

**Poly(ethylene glycol) methyl ether-block-poly(lactide-co-glycolide)**

PEG average  $M_n$  5,000, PLGA average  $M_n$  5,000, lactide:glycolide 80:20



911399

**Poly(ethylene glycol) methyl ether-block-poly(lactide-co-glycolide)**

PEG average  $M_n$  2,000, PLGA average  $M_n$  10,000, lactide:glycolide 80:20



910791

**Poly(ethylene glycol)-block-polyethyleneimine**

PEG  $M_n$  750, PEI  $M_n$  15k



908843

**Poly(lactide-co-glycolide)-b-poly(ethylene glycol)-b-poly(lactide-co-glycolide)**

average  $M_n$  (1,600-1,500-1,600), lactide:glycolide 75:25

909076

**Poly(lactide-co-glycolide)-b-poly(ethylene glycol)-b-poly(lactide-co-glycolide)**

average  $M_n$  (1,700-1,500-1,700), lactide:glycolide (95:5)



81330

**Poly(methylhydrosiloxane)**

viscosity 15-40 mPa.s (20 °C)



456640

**Poly(oxy-1,4-phenyleneoxy-1,4-phenylenecarbonyl-1,4-phenylene)**



191094

**Poly(oxy-1,4-phenylenesulfonyl-1,4-phenylene)**

pellets



472360

**Poly(oxy-1,4-phenylenesulfonyl-1,4-phenylene)**

melt index 6 g/10 min (380°C/2.16 kg)



428302

**Polysulfone**

average  $M_w$  ~35,000 by LS, average  $M_n$  ~16,000 by MO, pellets (Transparent)



182443

**Polysulfone**

average  $M_n$  ~22,000 by MO, beads



TRD3D0026

**Shogun superior PLA 3D printing filament**

natural, diam. 1.75 mm



TRD3D0039

**Stiron HIPS 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0040

**Stiron HIPS 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0061

**Tenax PC-ABS 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0060

**Tenax PC-ABS 3D Printing Filament**

signal white, diam. 1.75 mm



440337

**Tung oil**



TRD3D0051

**UltrafleXX TPE-E 3D printing filament**

signal white, diam. 1.75 mm



TRD3D0053

**UltrafleXX+ TPE-E 3D printing filament**

signal white, diam. 1.75 mm



TRD3D0054

**UltrafleXX+ TPE-E 3D printing filament**

black hole, diam. 1.75 mm



900166

**UV curable resin**

adhesible to plastics and glass, low viscosity



TRD3D0032

**UV729 ASA 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0033

**UV729 ASA 3D Printing Filament**

signal white, diam. 1.75 mm



# Printed Electronic Materials



Printed electronics involves the production of ultra-thin, lightweight, flexible, large-area electronics using printing technology. It directly integrates electronic components in the printing process. Examples include thin-film transistors (TFTs), organic light emitting diodes (OLEDs), sensors, flexible displays, solar cells, and other energy harvesters, radio-frequency identification (RFID) tags, batteries and other energy storage materials. Printed electronics is a rapidly growing research area, finding applications in the automotive industry, consumer electronics, smart buildings, smart packaging, healthcare, and the Internet of Things (IoT).

We offer a wide range of printable inks and substrates as building blocks of electronic printed devices.

- **Printable Inks**
- **Substrates**

## PRINTABLE INKS

Our printable inks have specific rheological properties and can be divided into three main categories: conductors, semiconductors, and dielectric materials. Deposition techniques for patterning these colloidal ink solutions enable structures with desired thickness and resolution in inkjet printing, screen printing, gravure printing, slot-die printing, aerosol jet printing and others. Each technique requires the proper tuning of a set of different ink parameters, such as viscosity, surface tension, conductivity, and compatibility of the solvents with the underlying materials to enable a consistent printing process.

### Conductive Inks

Our conductive inks are the main building block of all printed electronic devices, providing the fundamental device structure and integrated circuit interconnects. We offer metal nanoparticle and microparticle inks for various type of printing techniques:

- Silver (Ag) inks with good physical properties and electrical conductivities
- Gold (Au), platinum (Pt), copper (Cu) and nickel (Ni) inks preferred for electrochemical sensors, batteries and fuel cells
- Flexible and biocompatible conducting polymer inks essential for bioelectronics
- Well characterized carbon nanomaterial inks, with large surface area, low defect, high chemical stability, and mechanical flexible, attractive for electrode materials in printed batteries, supercapacitors, stretchable bioelectronics, and wearable sensors

## Semiconductor Inks

Semiconductor inks are the core component of printed electronic devices and largely determine the performance of the final device. We offer a broad selection of both conventional organic and inorganic semiconductor inks, and next generation two-dimensional material inks:

- Inorganic metal oxide ink, and organic semiconductor inks offer consistent properties such as mobility and bandgap, providing reliable performance for printed Organic Light Emitting Diode (OLED), Field Effect Transistors (FET), and Organic Solar Cells (OSCs) devices
- Emerging 2D nanomaterial inks offer direct bandgap, low defect, ease of fabrication, and the opportunity to fabricate novel, vertically-integrated next-generation electronic devices

## Dielectric Inks

Dielectric inks and coatings play an important role in protecting and enhancing the operation of conductive materials, completing energy storage devices, and enabling electronic devices that operate under a bias voltage. Our dielectric inks are composed of organic polymers or ceramics in solvents and novel insulating 2D nanomaterials, such as hexagonal boron nitride, to provide temperature and electrochemical stability, which are important for solid state batteries, field effect transistors, and neuromorphic devices.

## SUBSTRATES

Operating temperature range, roughness, mechanical property, transparency, and suitable wettability are important parameters to consider when selecting a substrate. A surface treatment process with proper chemicals typically helps to improve the wettability of the substrate with selected inks. We offer a range of conducting substrates coated with Indium Tin Oxide (ITO) or Fluorine-doped Tin Oxide (FTO), either on glass or flexible plastics, available in various substrate thicknesses and surface resistivities.

901662

### **3D Printing Graphite Ink**



910643

### **Cleaning solution for Ag ink**



TRD3D0016

### **Fusion PLA 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0018

### **Fusion PLA 3D Printing Filament**

neptune blue, diam. 1.75 mm



TRD3D0017

### **Fusion PLA 3D Printing Filament**

industrial grey, diam. 1.75 mm



TRD3D0019

**Fusion PLA 3D Printing Filament**

red race, diam. 1.75 mm



TRD3D0020

**Fusion PLA 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0037

**G-PET PETG 3D Printing Filament**

ruby variocolor, diam. 1.75 mm



TRD3D0035

**G-PET PETG 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0036

**G-PET PETG 3D Printing Filament**

azul variocolor, diam. 1.75 mm



TRD3D0034

**G-PET PETG 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0022

**Gonzales High Speed PLA 3D Printing Filament**

neptune blue, diam. 1.75 mm



TRD3D0023

**Gonzales High Speed PLA 3D Printing Filament**

red race, diam. 1.75 mm



TRD3D0024

**Gonzales High Speed PLA 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0021

**Gonzales High Speed PLA 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0038

**HIRMA PMMA 3D Printing Filament**

transparent, diam. 1.75 mm



TRD3D0025

**Kyotoflex BioFlexible PLA 3D printing filament**

neptune blue, diam. 1.75 mm



TRD3D0055

**Longchain Nylon 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0056

**Longchain Nylon 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0028

**Performance ABS 3D Printing Filament**

industrial grey, diam. 1.75 mm

TRD3D0029

**Performance ABS 3D Printing Filament**

neptune blue, diam. 1.75 mm



TRD3D0027

**Performance ABS 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0030

**Performance ABS 3D Printing Filament**

red race, diam. 1.75 mm



TRD3D0031

**Performance ABS 3D Printing Filament**

signal white, diam. 1.75 mm



902497

**Polymer dielectric grey for screen printing**



907669

**Silver ink**

75 wt%, LIFT printable



923575

**Silver nano ink**

Screen printable, Photonically curable



923559

**Silver nano ink**

aerosol printable



908460

**Silver nano ink, aerosol jet printable**



901773

**Silver/silver chloride (60/40) paste for screen printing**



TRD3D0039

**Stiron HIPS 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0040

**Stiron HIPS 3D Printing Filament**

black hole, diam. 1.75 mm



901970

**SunTronic® conductive graphite ink for flexographic printing**



901879

**SunTronic® conductive silver ink for screen printing**



901974

**SunTronic® UV curing jettable insulator for low-K dielectric applications**



TRD3D0061

**Tenax PC-ABS 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0060

**Tenax PC-ABS 3D Printing Filament**

signal white, diam. 1.75 mm



TRD3D0032

**UV729 ASA 3D Printing Filament**

black hole, diam. 1.75 mm



TRD3D0033

**UV729 ASA 3D Printing Filament**

signal white, diam. 1.75 mm

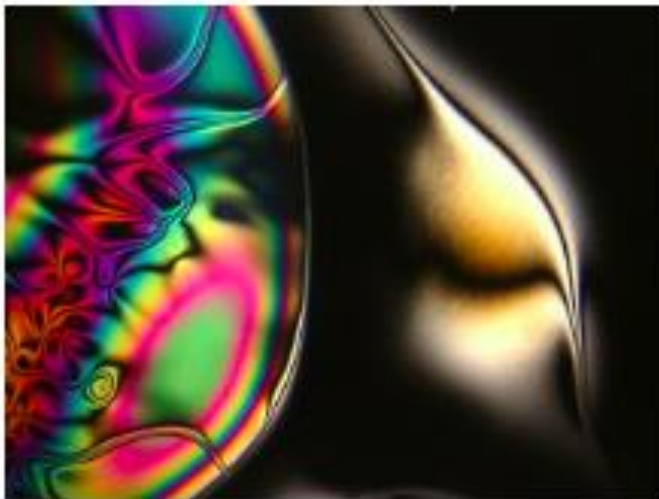


921580

**ZnO nanoparticle ink solution**

2.5 wt. %, viscosity 3 cP , work function 3.9 eV

## Liquid Crystals



Liquid crystals are highly structured liquids, with the orientational (nematic, cholesteric) and positional (smectic) order of constituent molecules. The type of molecular order is controlled by the shape and chirality of liquid crystal molecules, with over one hundred known liquid crystal phases. Molecular alignment in liquid crystal films results in optical properties (e.g. refractive index, reflectivity, transmission) that can vary with wavelength (color) and polarization of incident light.

Liquid crystals are stimuli-responsive materials. Their molecular order is sensitive to their environment, e.g. temperature, electric and magnetic fields, or adsorption of chemicals. Due to the two key attributes of liquid crystals, liquid-like behavior and optical anisotropy, liquid crystals are primarily used in switchable displays and optoelectronic devices. Liquid crystalline polymer networks and elastomers are promising stimuli-responsive materials under close investigation by academic, governmental, and industrial researchers for potential applications in soft robotics, ruggedized electronics, and the health sciences.

We offer many well-defined nematic, cholesteric, and smectic molecular liquid crystals, as well as discotic liquid crystals and several polymeric liquid crystal materials. In addition, we offer a selection of liquid crystal mesogens, which are molecular blocks known to have liquid crystalline order. Our liquid crystal building blocks are synthons commonly used to make liquid crystal molecules. Discover our broad portfolio of innovative liquid crystal materials to accelerate your scientific breakthroughs.

366854

**1-(*trans*-4-Hexylcyclohexyl)-4-isothiocyanatobenzene**

liquid crystal (nematic), 99%



278602

**1-Dodecylpyridinium chloride hydrate**

98%



576514

**1,4-Bis(decyloxy)benzene**

98%



338656

**4'-(Hexyloxy)-4-biphenylcarbonitrile**

liquid crystal (nematic), 96%



535494

**4'-Bromomethyl-2-biphenylcarbonitrile**

97%



330817

**4'-Heptyl-4-biphenylcarbonitrile**

98%



374784

**4'-Hydroxy-4-biphenylcarbonitrile**

97%



338680

**4'-Octyl-4-biphenylcarbonitrile**

liquid crystal (nematic), 98%



328510

**4'-Pentyl-4-biphenylcarbonitrile**

liquid crystal (nematic), 98%



C89803

**4-Cyanobenzoic acid**

99%



M13807

**4-Methoxycinnamic acid, predominantly *trans***

99%



588474

**6-[4-(4-Cyanophenyl)phenoxy]hexyl methacrylate**

96%



151114

**Cholesteryl acetate**

97%



C6512

**Cholesteryl hemisuccinate**



151157

**Cholesteryl oleyl carbonate**



158224

**N-(4-Methoxybenzylidene)-4-butaniline**

98%



149187

**Phenyl salicylate**

ReagentPlus®, 99%



922986

**TpOx-1-Nap**



922994

**TpOx-2-An**



922811

**TpOx-2-Nap**

922277

**TpOx-B15C5**



922935

**TpOx-n-Non**



922927

**TpOx-Ph**



922854

**TpOx-Ph-m-CF3**



922846

**TpOx-Ph-m-CN**



923001

**TpOx-Ph-m-Me**



922285

**TpOx-Ph-o-Cl**



922269

**TpOx-Ph-opo-3F**



922943

**TpOx-Ph-p-CF3**



922951

**TpOx-Ph-p-CN**



922870

**TpOx-Ph-p-Me**



922293

**TpOx-Ph-p-OMe**



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