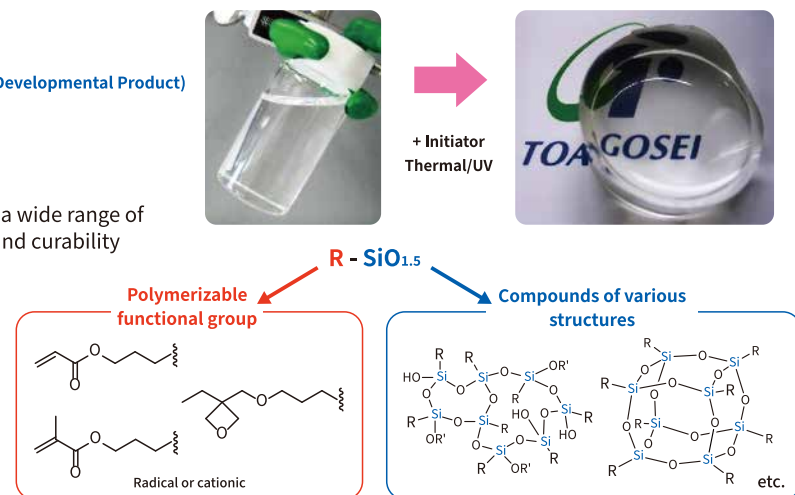


Optical Waveguide Materials

[Silsesquioxane Derivatives – SQ Series].....(Developmental Product)

Si-based organic–inorganic hybrid materials

- Applications: Hard coats, low-refractive-index materials
- Features: Liquid form for ease of handling; compatible with a wide range of organic materials; excellent heat resistance, transparency, and curability



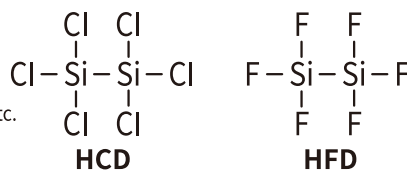
[Silicon Halides].....(Developmental Product)

An extensive product lineup

Hexachlorodisilane (HCD; Si₂Cl₆)

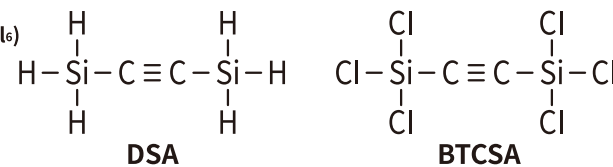
Hexafluorodisilane (HFD; Si₂F₆)

- Applications: SiN films for optical waveguides, etc.
- Features: No residual chlorine



Disilylacetylene (DSA; C₂Si₂H₆), Bis(trichlorosilyl)acetylene (BTCSA; C₂Si₂Cl₆)

- Applications: SiC and SiOC films for optical waveguides, etc.
- Features: Yields SiC or SiOC films free of CH-based impurities

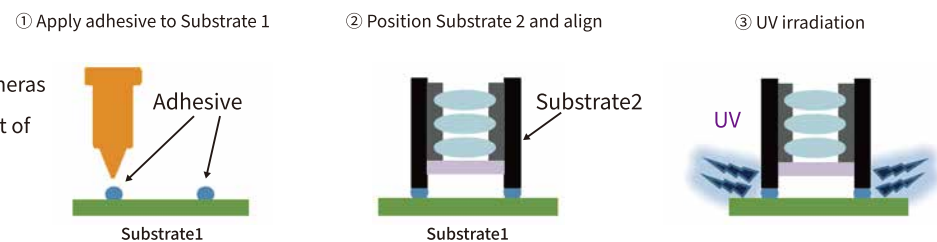


Adhesives

[Optical Adhesive for Precision Bonding].....(Developmental Product)

A UV-curable adhesive designed for high-precision fixing applications

- Applications: Various sensors, in-vehicle cameras
- Features: Low cure shrinkage, low coefficient of linear expansion, short UV exposure time (no thermal cure required)



The information contained in this technical document is intended to introduce potential uses of our products and reflects information available as of July 2026; it is provided without any warranty, express or implied. For information regarding the safe storage, use, and disposal of our products, please contact your TOAGOSEI representative.

TOAGOSEI CO.,LTD. URL: <https://www.toagosei.co.jp>

Head Office: 1-14-1 Nishi-Shimbashi, Minato-ku, Tokyo 105-8419, Japan
TEL: 03(3597) 7215 FAX: 03(3597) 7217

Nagoya Branch: 6F Taiju Life Nagoya Bldg., 1-4-6 Nishiki, Naka-ku, Nagoya, Aichi 460-0003, Japan
TEL: 052(209) 8591 FAX: 052(209) 8671

Fukuoka Sales Office: 6F No. 7 Myojo Bldg., 4-1-1 Tenjin, Chuo-ku, Fukuoka 810-0001, Japan
TEL: 092(721) 1902 FAX: 092(721) 1914

Osaka Branch: 11F Nakanoshima Mitsui Bldg., 3-3-3 Nakanoshima, Kita-ku, Osaka 530-0005, Japan
TEL: 06(6446) 6551 FAX: 06(6446) 6571

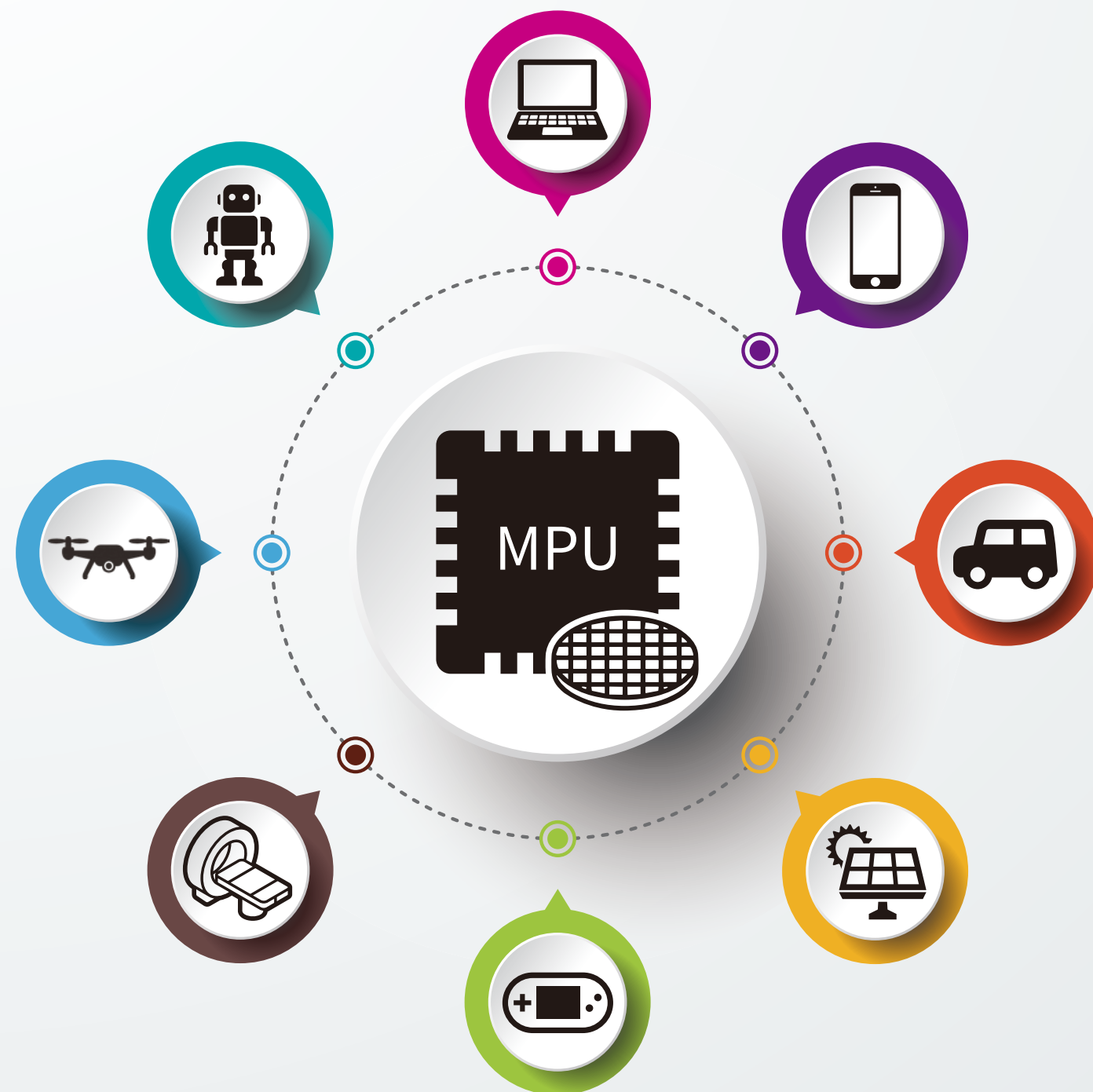
Shikoku Sales Office: 2-4-1 Showa-cho, Sakaide, Kagawa 762-0004, Japan
TEL: 0877(46) 3300 FAX: 0877(46) 3200



Products for the Semiconductor Industry

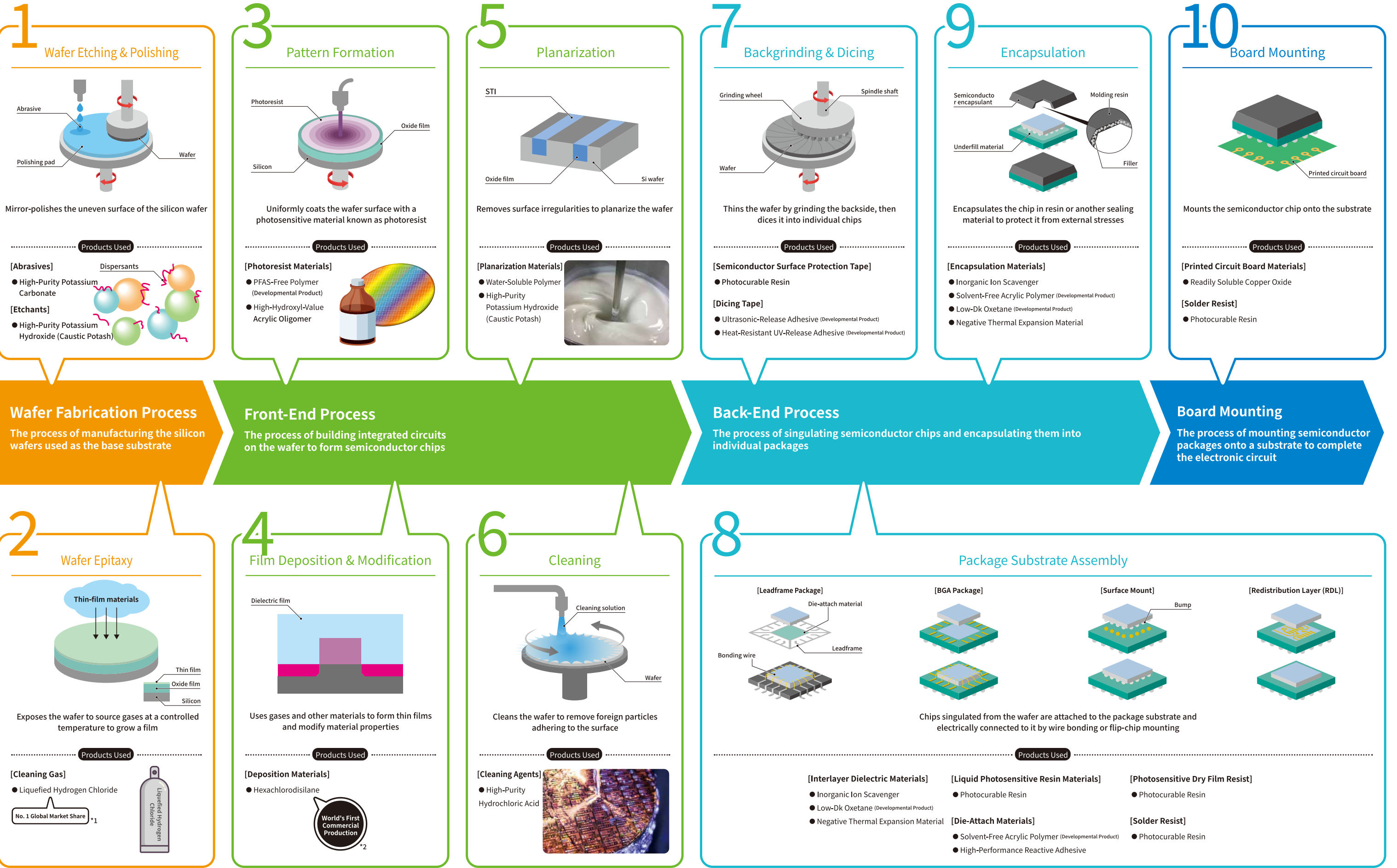
An introduction to semiconductor products from the TOAGOSEI Group.

TOAGOSEI TECHNOLOGY



TOAGOSEI Products Used Across the Semiconductor Manufacturing Process

[Semiconductor Manufacturing Flow]



TOAGOSEI's Proprietary Technologies

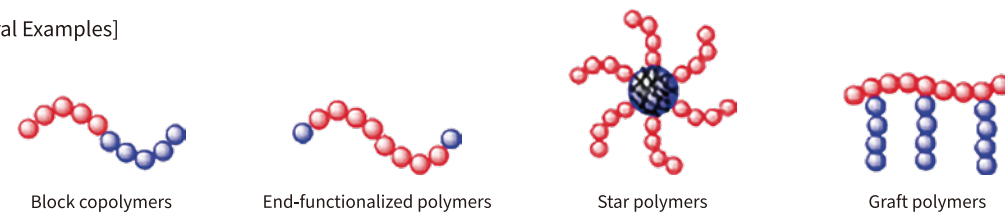


Polymer Synthesis Technology

● Polymer Structure Design and Control Technology

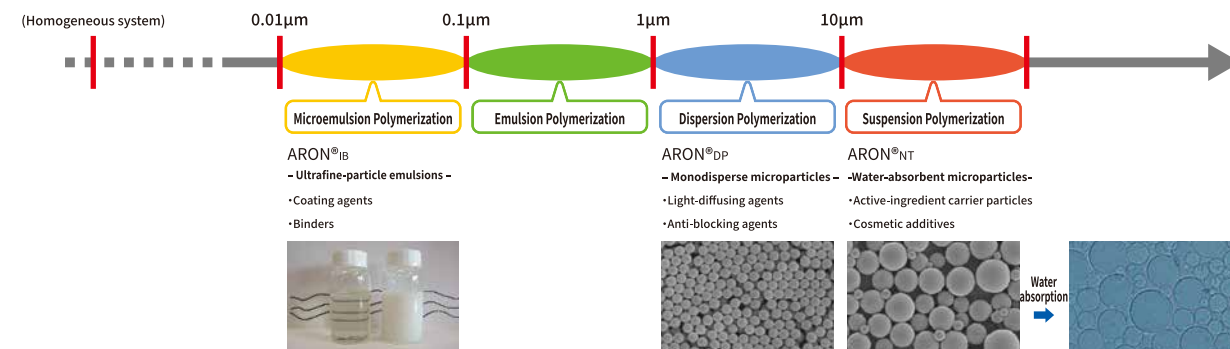
By designing polymer architecture, we can produce polymers with a wide range of functionalities.

[Structural Examples]



● Particle Size Control Technology

Drawing on years of accumulated polymerization expertise, we synthesize polymer microparticles across a broad range of particle sizes.



High-Purification Technology

Examples: high-purity liquefied hydrogen chloride, high-purity hydrochloric acid, high-purity potassium hydroxide, cleaning-grade polymers

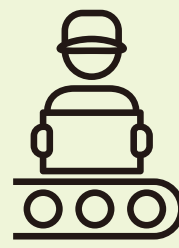
[Equipment Management]

Cleanroom conditions and rigorous cleaning protocols are maintained to thoroughly eliminate metallic contamination and foreign particles from process equipment.



[Manufacturing Control]

We maintain strict control over raw material specifications, incoming inspection, storage conditions, and pretreatment, and manage the entire manufacturing process—including reaction-condition optimization and contamination prevention.



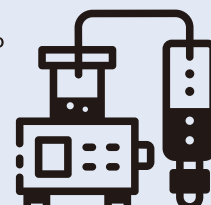
[Quality Control Technology]

Product purity is verified by analyzing trace metal content down to the parts-per-trillion (ppt) level, and containers are inspected to confirm they are free of even minute contamination prior to storage.



[Purification and Separation Technology]

Impurities are removed from the product through filtration, distillation, and ion adsorption to achieve higher purity.



Wafer Fabrication Process

■ Abrasives & Etchants

[High-Purity Potassium Hydroxide / High-Purity Potassium Carbonate]

High purity achieved through a proprietary manufacturing process

- Applications: Raw materials for CMP slurries and cleaning agents
- Features: Produced in-house from raw material through packaged product, enabling metal content to be controlled at the ppb level

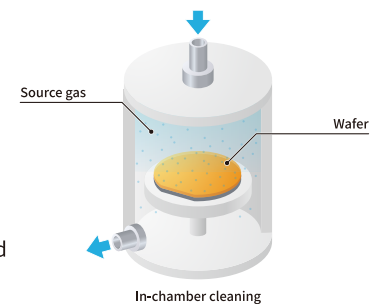
	KOH [%]	K ₂ CO ₃ [%]	Na [ppm]	Fe [ppb]
Super KOH Ex-α	48.0-49.0	≤0.1	≤5	≤5
Super KOH R	48.0-49.0	≤0.1	≤100	≤500
KOH L-HM	48.0-49.0	≤0.2	≤2000	≤50
High-Purity Potassium Carbonate	≤0.5	49.0-51.0	≤50	≤300

■ Cleaning Gas

[High-Purity Liquefied Hydrogen Chloride]

An indispensable high-purity grade for semiconductor manufacturing

- Applications: In-chamber equipment cleaning following thin-film deposition, etc.
- Features: Fully integrated in-house control from raw material through cylinder preparation and pressure testing, delivering purity of 99.999% or higher



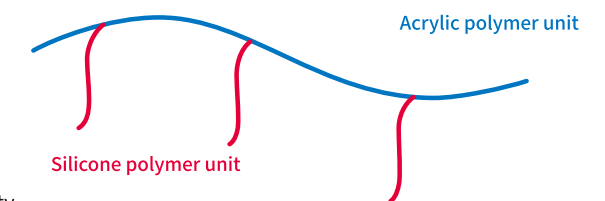
Front-End Process Products

■ Photoresist Materials

[Silicone Graft Polymer] (Developmental Product)

Proposed as a PFAS alternative

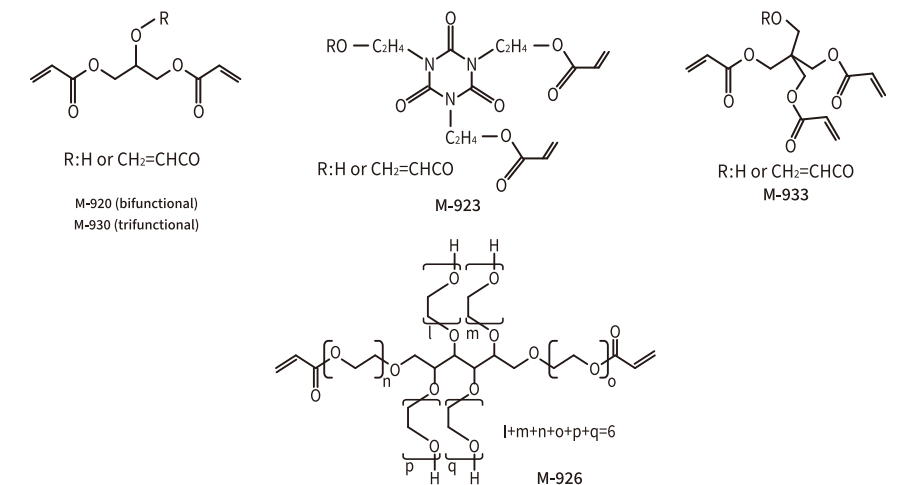
- Applications: Additive for immersion ArF photoresists
- Features: Backbone and branch segments are engineered with distinct functions
 - Backbone: provides compatibility with the resist and enables alkaline developability
 - Branches: silicone side chains impart high surface water repellency (receding contact angle >70°)
- * Polymer structure and composition can be customized on request



[High-Hydroxyl-Value Acrylic Oligomer]

Molecularly designed via a proprietary synthesis method

- Applications: Crosslinking agent for semiconductor resists
- Features: Toluene-free, reducing health and safety concerns; high hydroxyl value and hydrophilicity; imparts toughness while maintaining excellent developability
- * A high-purity grade is also under development

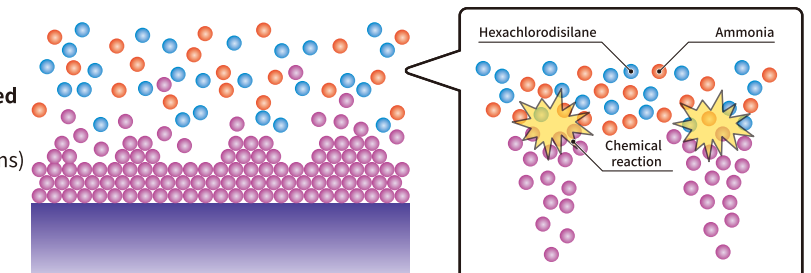


■ Deposition Materials

[Hexachlorodisilane]

A semiconductor deposition material first commercialized globally by TOAGOSEI

- Applications: Thin-film deposition on silicon wafers (SiN films)
- Features: Ultra-high purity, >99.9999% on a metals basis



Front-End Process Products

Cleaning Agents

[High-Purity Hydrochloric Acid]

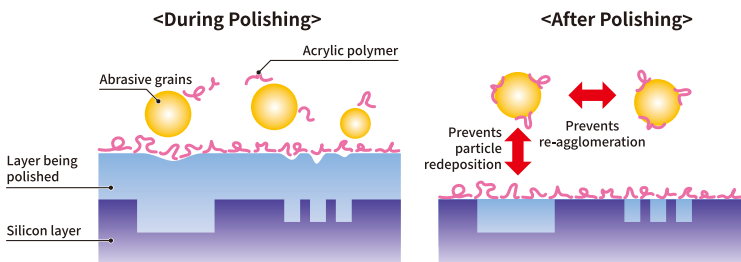
- A grade optimized for the removal of metallic impurities
- Applications: Raw material for semiconductor process cleaning solutions (targeting removal of metallic impurities)
 $HCl:H_2O_2:H_2O = 1:1-2:5-7$
Dissolves impurities on the wafer surface as complex compounds for removal
 - Features: Metal content controlled at the ppt level

Roles of Various Cleaning Solutions					Purpose
HCl	-	H ₂ O ₂	-	H ₂ O	Metal removal
NH ₄ OH	-	H ₂ O ₂	-	H ₂ O	Particle removal
H ₂ SO ₄	-	H ₂ O ₂	-	H ₂ O	Organic residue removal
HF	-	H ₂ O ₂	-	H ₂ O	Native oxide removal
HF	-	H ₂ O ₂	-		Oxide film removal / native oxide removal
HF	-	NH ₄ F	-	H ₂ O	Oxide film etching (buffered solution)
H ₃ PO ₄					Selective etching of Si ₃ N ₄
O ₃	-	H ₂ O	-		Organic residue removal

Planarization Materials

[Water-Soluble Polymer]

- Acrylic polymers formulated to meet a wide range of process conditions
- Applications: CMP slurries, post-CMP cleaning agents, scale inhibitors, etc.
 - Features: Polymers can be custom-designed to meet specific process needs
 - Adjustment of degree of polymerization (controls dispersion, aggregation, and viscosity)
 - Selection of functional groups (controls adsorption behavior)
 - Control of metal content within the polymer

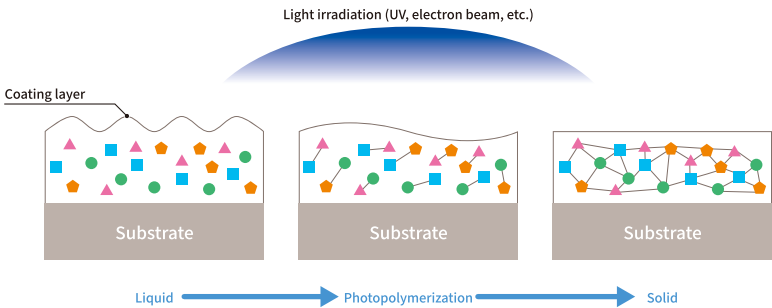


Back-End Process Products

Insulating Materials

[Photocurable Resin (ARONIX®)]

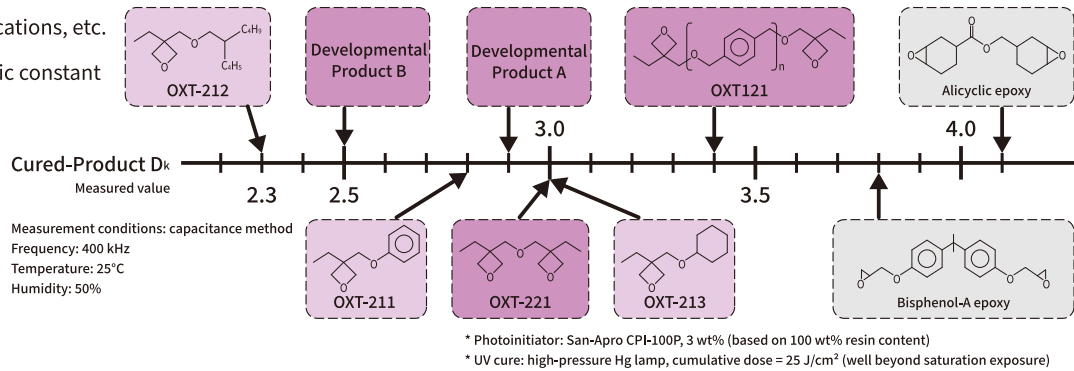
- A broad lineup of acrylic monomers and oligomers
- Applications: Back-grinding tape, solder resist, ink, hard coat, paint, etc.
 - Features: Cures instantly at room temperature upon light exposure, offering energy savings, low environmental impact, and low running cost



[Low-Dk Oxetane].....(Developmental Product)

Excellent UV curability combined with a low dielectric constant after cure

- Applications: Interposer applications, etc.
- Features: High Tg, low dielectric constant

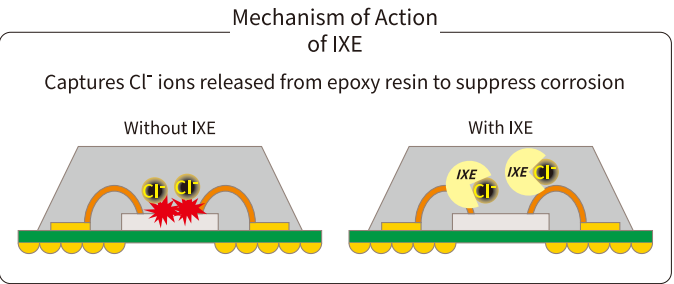


Back-End Process Products

High-Performance Fillers

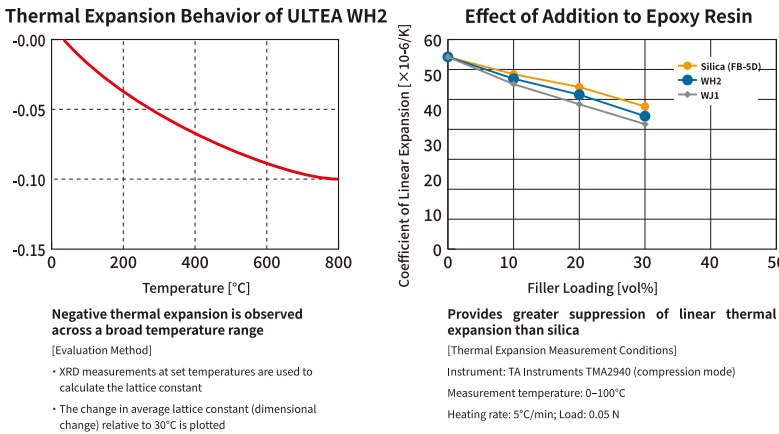
[Inorganic Ion Scavenger (IXE®, IXEPLAS®)]

- An ion scavenger combining excellent ion-capture capability with high heat resistance
- Applications: IC encapsulants (EMC, liquid encapsulant), FPC adhesives, solder resist, underfill, etc.
 - Features: Excellent heat resistance (usable above 100°C), resistant to molten resin exposure, selectively traps target ions



[Negative Thermal Expansion Material (ULTEA®)]

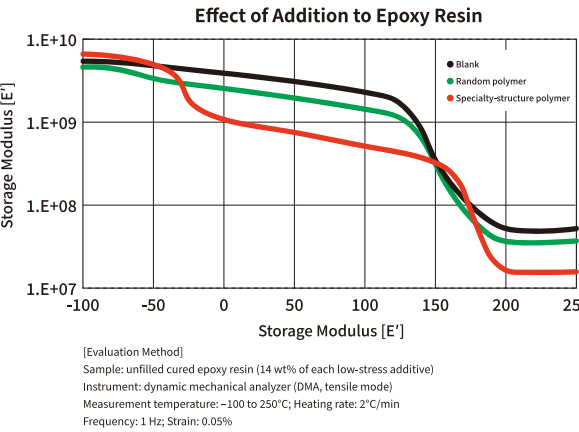
- A negative-thermal-expansion filler that contracts in volume upon heating
- Applications: Sealing glass (fluorescent tubes, PDPs, OLEDs, etc.), adhesives, etc.
 - Features: Exhibits negative thermal expansion across a broad temperature range (30–800°C); free of environmentally toxic heavy metals



Low-Stress Additives for Epoxy Resin

[Specialty-Structure Acrylic Polymer] (Developmental Product)

- A polymer effective for reducing stress (lowering modulus) in epoxy resins
- Applications: Semiconductor encapsulants, copper-clad laminates (CCL), etc.
 - Features: Delivers a pronounced modulus-reduction effect when added to epoxy resin; halogen-free raw materials; can be designed to match specific epoxy chemistries

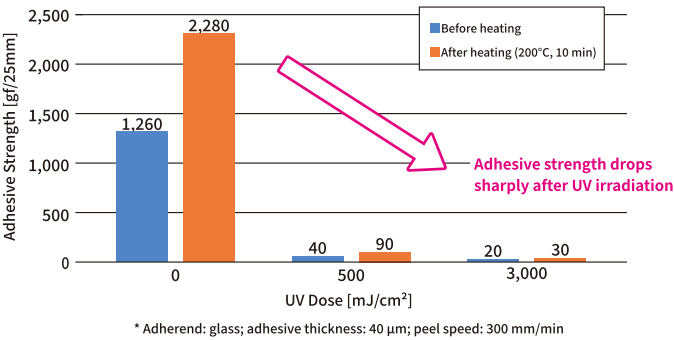


Adhesive & Bonding Tapes

[Heat-Resistant UV-Release Adhesive] (Developmental Product)

A UV-release tape suitable for high-temperature processes

- Applications: Temporary bonding or surface protection tape for high-temperature processes such as sputtering and reflow
- Features: No outgassing even after prolonged high-temperature exposure (up to 250°C); adhesive strength drops sharply upon UV irradiation; leaves no adhesive residue upon removal



[Ultrasonic-Release Adhesive] (Developmental Product)

An ultrasonic-release tape with high solder-reflow heat resistance

- Applications: Temporary bonding or surface protection tape for heating processes
- Features: High heat resistance (solder-reflow resistant to 260°C) combined with high adhesion (>3 N/cm); releasable via ultrasonic debonding in approximately 5 minutes

