

This chart provides a general overview of DuPont materials offered for both semiconductor fabrication and packaging processes.

DUPONT SEMICONDUCTOR FABRICATION & PACKAGING MATERIALS PRODUCT OFFERINGS & PROCESS STAGES	Lithography	Etch & Clean	Deposition	Planarization	Infrastructure	Packaging
DuPont EKC Technology removers	●	●		●		●
HD MicroSystems™ liquid polyimides & PBO	●					●
DuPont Electronic Polymers — photoresist & ARC polymers	●					
DuPont Air Products NanoMaterials				●		
DuPont Fluoroproducts						
Teflon® fluoropolymers						
high-purity fluid handling systems	●	●		●	●	
amorphous fluoropolymers						●
Zyron® electronic gases		●	●			
Vertrel® specialty fluids		●				
Vespel® parts & shapes		●	●	●	●	
DuPont Performance Elastomers — Kalrez® perfluoroelastomer parts	●	●	●		●	
DuPont FE clean agent fire extinguishants					●	
Tyvek® wafer interleaf					●	
Sontara® cleanroom wipes					●	
DuPont Personal Protection — protective apparel & accessories		●			●	
DuPont Advanced Packaging Lithography films						●
GreenTape™ low temperature co-fired ceramics						●
Interra™ embedded passive materials						●
Zenite® LCP resins						●

DuPont Offerings

SEMICONDUCTOR FABRICATION MATERIALS

Lithography - Lithography is the defining technology for advanced semiconductor manufacture, and critical lithographic performance is largely dependent upon the quality of the polymers in the chosen photoresist. Our electronic grade polymers are produced under stringently controlled conditions and are thoroughly tested to ensure the highest performance available for critical applications. Each product is typically tested for 12 metals, polydispersity, molecular weight and transparency. Each process is controlled through statistical monitoring so that batch to batch variation is held to a minimum. Our materials for lithography include: polyimide films for stress buffers, polymers for photoresist, polyimides as an interlayer dielectric, and planarization and gap fill materials.

Etch & Clean - DuPont semiconductor fabrication materials include wet clean and surface preparation solvents and removers, post clean surface treatments, dry chamber cleaning gases, and plasma etch solutions for etch and clean processes.

Deposition – DuPont deposition materials include chamber cleaning gases for fast, economic and low emission cleaning for CVD and PECVD tools; high performance sealing, delivering outstanding thermal stability, very low outgassing and excellent elastic recovery; and customer parts to provide ultra-high thermal resistance, excellent plasma and superior chemical resistance.

Chemical Mechanical Planarization (CMP) - DuPont offers CMP slurries for planarization and wafer polishing, and cleaning chemicals for post-CMP cleaning solutions for the CMP process.

SEMICONDUCTOR FABRICATION EQUIPMENT AND SUPPORT SYSTEMS

Components, Parts & Accessories - Semiconductor manufacturing involves aggressive chemicals and gases. To ensure safety and purity requirements, DuPont offers a broad range of materials to improve the manufacturing equipment performance.

Our materials include: gaskets, seals, o-rings, elastomers and resins, pipe, tubing, hose, flanges, connectors, couplings and plumbing fittings, and raw materials for custom components.

Infrastructure Materials - DuPont offers a wide range of products for cooling and protecting people and equipment in the manufacturing and fabrication processes – from ducting materials to etching and cleaning chemicals, from contamination control to waste disposal.

Support Materials - Materials to support semiconductor manufacturing are critical to the overall performance. As a science company, DuPont has developed several unique materials that can help improve the overall safety, efficiency, and cost of ownership for semiconductor operations. Our support material offerings include: cleanroom apparel and wipes; cleaning solutions and solvents; device

and wafer handling systems; clean agent fire extinguishants; laboratory apparatus and supplies; and lubricating oils and greases.

DuPont™ Hybrid Membrane Technology (HMT) - DuPont™ HMT applications for liquid filtration and HVAC support the demanding needs of semiconductor manufacturing operations. DuPont™ HMT in liquid filtration applications has a mean pore size of as little as 0.5 microns for better initial and sustained particle retention and offers high-efficiency liquid filtration at temperatures up to 135°C. The flow rate of DuPont™ HMT is 2-3 times greater than calendered meltblowns of similar filtration efficiency and thickness, which can significantly improve semiconductor manufacturing efficiency.

DuPont HVAC filters with DuPont™ HMT, provide low initial pressure drop, non-diminishing performance based on mechanical filtration and superior particle capture in the sub-micron range (0.3 -1.0) for improved air quality and energy savings in critical semiconductor manufacturing process. DuPont™ HMT is a boron-free synthetic media to help eliminate contamination in the production environment.

SEMICONDUCTOR PACKAGING MATERIALS

Advanced Semiconductor Packages - DuPont offers a growing portfolio of dielectric materials, laminates and microlithographic polymer films used in advanced chip-scale, wafer level and flip chip packages. Advanced packaging developments include low CTE microvia build up films, thinner non-woven reinforcements for low CTE laminates, permanent photodefinable dry films and embedded passive materials.

Integrated Wafer Level Packaging Solutions - DuPont is connecting science and technology from across the company to design integrated wafer level packaging solutions for both current and emerging wafer level packaging requirements. A great example is the new set of codesigned products:

- DuPont™ WBR2000 dry film photoresist and;
- DuPont™ EKC162™ photoresist removers

These products together provide a step change in fine pitch bump formation and clean resist removal to meet the most challenging wafer level and flip chip bumping requirements. These technologies, also combined with the HD MicroSystems line of redistribution dielectrics, provide a tested and proven integrated solution for area array package requirements, whether stencil printed, plated, pillared or C4 applied.

Key benefits of these integrated solutions include higher yields, increased reliability and lower cost of ownership.

Modules - Hermetic multichip modules are currently the standard method for packaging Integrated Circuits (ICs) requiring high reliability and performance. The need for hermetic packaging is becoming even more critical with increased circuit density and closer packing of bare ICs. DuPont is working with key OEM design engineers to understand the importance of materials in the designing of a robust module. We currently offer ceramic and organic material technologies to allow for the integration of active and passive components in packages for automotive, computer, commercial, telecommunications and military applications. Our technologies can provide tremendous benefits in terms of high performance and small size without sacrificing the high performance you might need.

Micro Electro Mechanical Systems (MEMS) - DuPont R&D and engineering resources continue to provide innovative ceramic and organic technologies to meet the growing demands of Micro Electro Mechanical Systems (MEMS) and Micro Systems Technology (MST) including: precise fine structures, hermetic, chemical resistance, and thermal management applications.