DURAZANE

INNOVATIVE POLYSILAZANE MATERIALS

INNOVATIVE POLYSILAZANE LIQUID COATING RESINS

Low Viscosity (<100 cps @ 20°C), Solvent Free & Fluorine Free
Excellent Adhesion to Most Substrates
Super High Hardness (9H+)
Extremely High Temp Resistance (up to 1800 °C)
Ultra-thin Clear Coat (Dozens of Nanometers to Micrometers)
Patented Technology from Europe

About AZ

Established in the 1950s, AZ Electronic Materials is a leading producer of high quality and high-purity specialty chemicals listed on the London Stock Exchange with headquarters in Luxembourg. We serve both the electronic and non-electronic markets. Our materials are widely used in integrated circuits (IC) and devices, flat panel displays (FPD), light-emitting diodes (LED), photolithographic printing, adhesives, pre-ceramic polymers, composites, paint and coatings.

Innovation is the lifeblood of our business and the ultimate competitive advantage. AZ has six principal R&D centers in Japan, South Korea, Taiwan, Germany, France and United States. AZ has a very strong intellectual property portfolio with over 2,200 patents granted. In 2012, some 81% of revenue of AZ derived from products with patented technology.

AZ operates polysilazane production facilities in Germany, Japan and India.

Applications of Polysilazanes

Industrial Coatings Technology
- High temperature
- Corrosion resistance
- Fire resistance
- Non-fouling
- Water repelling
- Wear & abrasion resistance
- Thermal barrier
- Anti-graffiti
- Easy-to-clean
- Mold releases

Adhesives
- Ceramics
- Metals
- Glass
- Organic material

Pre-Ceramic Polymers
- Ceramic binders
- Ceramic matrix composites
- Metal matrix composites
- Ceramic fibers

Hybrid Composites & Coatings
- Polyurea
- Silicone
- Epoxy
- Acrylic

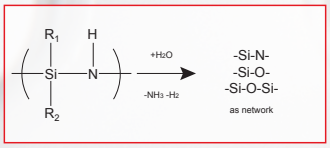
As the only manufacturer in the world offering the entire range of polysilazane resins on a commercial scale, AZ is recognized as a specialty chemicals pioneer. We are known as an innovator in the chemical industry.

We supply DURAZANE polysilazanes for architectural, industrial, OEM and special purpose coatings used in a wide spectrum of industries such as aerospace, automotive, metals, construction, electronics and composites. AZ DURAZANE polysilazanes can be applied on wood, metal, plastic, glasses, ceramics and other surfaces. With manufacturing facilities and research and technology support centers located throughout the world, we provide responsive, local support to our customers, helping them to rapidly bring advanced coating solutions to the market by the utilization of polysilazane resins.

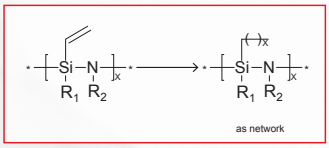
Polysilazanes (PSZ) are polymers in which silicon and nitrogen atoms alternate to form the basic backbone. Each silicon atom is bound to two separate nitrogen atoms and each nitrogen atom to two silicon atoms, and both chains and rings of the formula [R1R2Si–NR3]n occur. R1-R3 can be hydrogen atoms or organic substituents. If all substituents R are H atoms, the polymer is designated as Perhydropolysilazane (PHPS) or Inorganic Polysilazane ([H2Si–NH]n). If hydrocarbon substituents are bound to the silicon atoms, the polymers are designated as Organopolysilazanes (OPSZ).

	Organic Polysilazane (OPSZ)	Inorganic Polysilazne (PHPS)
Polymer	Si-N-H polymer with organic residues (contains carbon)	Pure Si-N-H polymer without carbon
After Curing	SiO2 layer with carbon residues; less carbon residues under high temp baking	Pure SiO2 layer (glass ceramic)
Cracking Threshold of Resin	30+µm layer	<2µm layer
Electrical Insulation	Good (carbon contamination)	Excellent (same as glass ceramic)
Hardness/Flexibility	Soft/bendable	Hard/brittle
Chemical Barrier (O2, H2O & other gases)	Good	Excellent
Surface Property	Hydrophobicity	Hydrophilicity
Application in Coatings	OPSZ, PHPS, blends of PHPS & OPSZ, blends of PSZ with other resins; Various "R"s with or without pigments & extenders, solvents & additives to modify properties; Catalysts to reduce curing temperature depending on specific application	

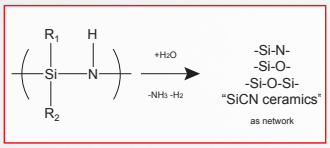
Curing of OPSZ



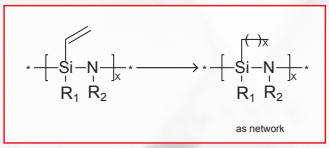
Moisture Cure



Free Radical Curing with free radical initiator (dicumyl peroxide)

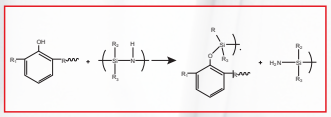


Thermal Cure

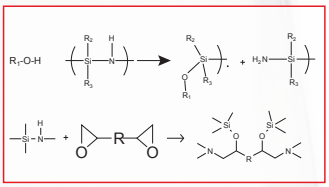


UV Curing in the presence of a UV sensitizer

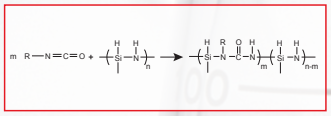
Reactive Systems of OPSZ with Other Organic Resins



Reaction with Phenols



Reaction with Epoxies



Reaction with Isocyanates

Organopolysilazane Products & Applications

OPSZ can easily compete with conventional binders in many different applications, and in some areas they have significant advantages. Besides pure polysilazane-based coating systems there is the possibility of hybrids, opening up a multitude of variations. These coating systems display excellent performance, service life and adhesion to substrates.

	DURAZANE 1500 RC	DURAZANE 1500 SC	DURAZANE 1800
Suggested Application			
Anti-graffiti Coatings	●	●	
Easy-to-clean Coatings	●	●	
Anti-scale Coatings	●	●	
Transportation Maintenance & Repair Coatings	●	●	
Transportation OEM Coatings	●	●	●
Coil Coatings	●	●	
Non-stick Coatings	●	●	●
Marble & Stone Coatings	●	●	●
Glass Coatings	●	●	●
Thermal Resistant Coatings*	●	●	●
Plastic Coatings	●	●	
Protective Coatings / Anticorrosive Coatings	●	●	●
Wood Coatings	●	●	
Architectural Coatings	●	●	●
Preferred Substrates			
Coatings	●	●	●
Steel, Stainless steel, Galvanized steel	●	●	●
Aluminum	●	●	●
Zinc	●	●	●
Copper, Brass and Bronze	●	●	●
Silver	●	●	●
Polycarbonate	●	●	
Polymethylmethacrylate	●	●	
Other Plastics	●	●	
Marble & Stone	●	●	●
Glass	●	●	●
Ceramic	●	●	●
Minerals	●	●	●
Carbon	●	●	●
Wood	●	●	
Curing Conditions			
Ambient Temp. Curing	●	●	
Thermal Curing	●	●	●
UV Curing			●

**Note: Operating temperatures up to 750 °C can be achieved by the use of DURAZANE 1500 RC or DURAZANE 1500 SC; Operating temperatures up to 1800 °C can be achieved by the use of DURAZANE 1800.*

OPSZ can be cold blended with any resins without chemical reaction among the ingredients, such as thermoplastic acrylics, silicones, hybrids of OPSZ and PHPS, and etc.

When OPSZ is heated to at least 850 °F (450 °C), the polymer will convert to inorganic ceramic (SiOx). The inorganic ceramics have super high hardness (up to 9H) and extremely high temp resistance (up to 1800 °C) due to their inherent properties.

Both PHPS and OPSZ are widely used in clear coatings by delivering durability against weathering, UV, chemical, corrosion, staining, graffiti, scratch, and heat.

The typical coating dry film thickness (DFT) of OPSZ-based clear coat is between 2 to 10 um, while the typical coating DFT of PHPS-based clear coat is between dozens of nanometers to 2 um.

Compared to alkyd melamine and 2K PU systems, OPSZ demonstrate better performance on gloss retention and weather resistance. Compared to silicone polyesters, OPSZ demonstrate better performance on thermal resistance. Aluminum coated with OPSZ-based coatings display no corrosion even after 100 days (2400 hours) in the salt spray test performed in accordance with ISO 7253. Steel coated with OPSZ-based coatings display no corrosion after 100 days (2400 hours) in the condensed water climate test carried out in accordance with ISO 6270. The films of OPSZ resins have a contact angle of around 95° to water, and this level is maintained over a long period. The contact angle to water of OPSZ-based coatings can be raised further, to more than 120°, with appropriate additives.

Perhydropolysilazanes (PHPS) Products

AZ offers entire range of Inorganic Polysilazanes for coatings application. With different additives and solvents used in the formulation, AZ's PHPS resins can be cured under different conditions from room to high temperature. After application, PHPS resins will convert to SiO2 (Silica) by reacting (dehydrogenation) with moisture or by heating.

Fundamental Properties of PHPS materials:

- Super high hardness (9h+)
- Hydrophilic property with water (< 10°)
- Excellent weather resistance
- Good acid resistance & barrier property
- High adhesion on various materials
- Transparent fine dense film
- High purity silica
- High flattening effect (low viscosity and high yield)

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ELECTRONIC MATERIALS