



Kalrez® perfluoroelastomer
parts

From DuPont Performance Elastomers

Introducing Kalrez® Perfluoroelastomer Parts For Photovoltaic Manufacturing Processes

Increase Uptime ...
Increase Throughput ...
Lower Cost of Ownership ...

As the demand for photovoltaic systems continues to rise, manufacturers must find ways to increase uptime and improve output. Frequently, more aggressive and efficient chemicals, and/or higher temperatures are employed to increase throughput; thereby, putting more strain on the manufacturing infrastructure. Unplanned maintenance due to incompatible sealing materials can interfere with production schedules causing downtime. As a result, sealing materials in either wafer-based or thin film processes should have broad chemical compatibility and excellent thermal stability.

Kalrez® perfluoroelastomer parts have been field proven in highly aggressive sealing environments for more than 30 years. Kalrez® parts can help improve sealing reliability in photovoltaic processes that use high heat, aggressive chemicals and plasma. Kalrez® seals resist over 1,800 chemicals including reactive gases and plasmas, alkalis, acids and solvents. Even in contact with these corrosive chemicals, Kalrez® seals retain their elastomeric properties at temperatures as high as 325°C. On page 2 are the suggested Kalrez® products for use in the different photovoltaic manufacturing processes and also for poly-silicon feedstock production and abatement systems.



Photovoltaic Product Selector Guide

Silicon wafer-based cell manufacturing processes

Surface Texturing/Cleaning Kalrez® PV8030	Doping Kalrez® PV8070/ PV8050	Edge Isolation Kalrez® PV8050	P Silicate Removal Kalrez® PV8030	ARC Coating Kalrez® PV8050	Metallization Kalrez® PV8070	Testing Sorting
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Process Type	Typical Process Environment	Suggested Kalrez® Product
Wafer Sawing Damage Removal Surface Texturing & Cleaning	HF, HNO ₃ , 80°C Concentrated NaOH, KOH, IPA, HCl, Hot Water	PV8030
N-Doping	850-900°C, POCl ₃ , Diffusion, In-Situ Cl ₂ Cleaning	PV8070/PV8050
Edge Isolation	CF ₄ /O ₂ Plasma Etching	PV8050
P Silicate Removal	NaOH, KOH, HF, HNO ₃ , HCl, etc.	PV8030
ARC Coating	SiH ₄ , NH ₃ , O ₂ Plasma PECVD or Reactive Sputtering, In-Situ NF ₃ Plasma Cleaning	PV8050
Metallization	Drying/Firing Process	PV8070

Other Process Types	Typical Process Environment	Suggested Kalrez® Product
Poly-Silicon Feedstock Production Siemens Technology	TCS CVD Deposition 1100°C, SiHCl ₃ , HCl, H ₂	PV8070/PV8050
Abatement Systems ("Wet" Scrubbers)	Strong Acids/Bases	PV8030

Thin film cell manufacturing processes

Back Contact	Patterning Laser Scribing	Cell Layer Deposition See Below For Product	Patterning Laser Scribing	TCO Deposition See Below For Product	Patterning Laser Scribing	Testing
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* Note - The order of the process steps can be different depending upon the module construction sequence.

Process Type	Typical Process Environment	Suggested Kalrez® Product
Cell Layer Deposition/Absorber		
<ul style="list-style-type: none"> • Amorphous/Micro-Crystalline Silicon 	SiH ₄ , H ₂ , Plasma PECVD, Remote NF ₃ Plasma Cleaning	9100
<ul style="list-style-type: none"> • CIS/CIGS <ul style="list-style-type: none"> ○ Diffusion ○ CdS Buffer Deposition 	500-550°C, H ₂ Se, H ₂ S Diffusion 65°C, Cd & S Salts Dissolved in NH ₄ OH	PV8070 PV8030
<ul style="list-style-type: none"> • Cadmium Telluride <ul style="list-style-type: none"> ○ Single Side Activation ○ Cadmium Etching ○ CdS Buffer Deposition 	400°C, CdCl ₂ Dissolved in Methanol, Concentrated H ₃ PO ₄ , HNO ₃ 65°C, Cd & S Salts Dissolved in NH ₄ OH	PV8050 PV8030 PV8030
TCO Deposition/Front Contact	ZnO Reactive Sputtering Diethyl Zinc (DEZ) MOCVD	PV8050 PV8030

Suggested Products for Photovoltaic Use

Kalrez® PV8030

Kalrez® PV8030 is a black product for PV cell manufacturing processes requiring resistance to “wet” process/cleaning chemistry including sawing damage removal, wafer surface texturing, P silicate removal and CdS buffer layer chemical bath deposition. It exhibits excellent resistance to aggressive chemicals including strong acids, bases, solvents and metal organic precursors. It also offers low metallic, anionic and total organic carbon (TOC) extractables and has excellent (low) compression set properties. Kalrez® PV8030 has good mechanical strength properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 275°C is suggested.

Kalrez® PV8050

Kalrez® PV8050 is a white product for PV cell manufacturing processes requiring resistance to “dry” process chemistry including TCS-based thermal CVD for poly-silicon feedstock production, plasma edge isolation and Silicon Nitride ARC Deposition. It exhibits very low weight loss in oxygen and fluorine-based plasma. It also offers excellent resistance to chlorine gas and has excellent (low) compression set and outgassing properties. Kalrez® PV8050 has good mechanical strength properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 300°C is suggested.

Kalrez® PV8070

Kalrez® PV8070 is a black product for PV cell manufacturing processes requiring high temperature resistance including doping for n-type layer formation (bulk c-Si), diffusion for Diselenide thermal implantation (CIGS) and TCS-based thermal CVD for poly-silicon feedstock production. It exhibits outstanding thermal stability and has excellent (low) compression set and outgassing properties. It also offers excellent resistance to chlorine and fluorine gas as well as other dry process chemistry. Kalrez® PV8070 has excellent mechanical strength properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 325°C is suggested. Short excursion to higher temperatures may also be possible.

Kalrez® 9100

Kalrez® 9100 is an amber translucent product for PV cell manufacturing processes requiring resistance to fluorine-based plasma including amorphous/microcrystalline silicon thin film deposition. It exhibits very low weight loss and ultra-low particle generation in fluorine-based plasma, e.g., NF₃, F₂, etc. It also offers excellent resistance to dry process chemistry and has excellent thermal stability, compression set and outgassing properties. Kalrez® 9100 has good mechanical strength properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 300°C is suggested.

Photovoltaic Product Information

Typical Physical Properties¹

Product	Color	Maximum		
		Hardness ² Shore M (O-ring)	Continuous Service Temperature ³ , °C	Compression Set, 70 Hrs. @ 204°C ⁴ , %
Kalrez® PV8030	Black	83	275	30
Kalrez® PV8050	White	72	300	17
Kalrez® PV8070	Black	83	325	14
Kalrez® 9100	Amber Translucent	74	300	17

¹ Not to be used for specification purposes

² ASTM D2240 & D1414 (AS568 K214 O-ring test specimens)

³ DuPont Performance Elastomers proprietary test method

⁴ ASTM D395B & D1414 (AS568 K214 O-ring test specimens)

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