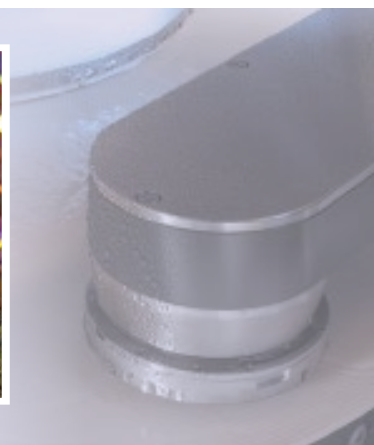
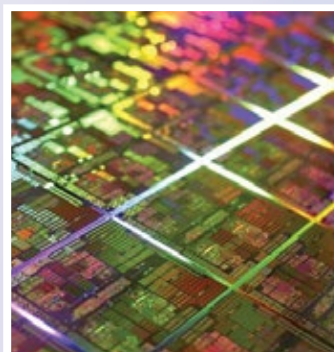
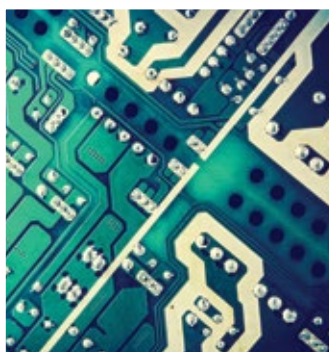


# SEMICONDUCTOR

## VACUUM CHAMBER SOLUTIONS

World's broadest portfolio of polymer solutions  
for use in vacuum chamber applications



**Typical Process Tools: Etch, CVD, PVD & Ion Implant**

## MATERIAL SOLUTIONS & KEY PROPERTIES

- / **Ketron® 1000 PEEK** - For use in lower power, lower heat (300°F) or indirect plasma chamber applications such as wafer mobility.
- / **Duratron® T4203 PAI** - For use in medium power, medium heat (500°F) applications or indirect chamber applications in presence of Oxygen plasma.
- / **Duratron® CU60 PBI** - For use in high power, high heat (750°F) applications or indirect chamber applications when in the presence of Oxygen plasma.
- / **Semitron® MPR1000** - For use in high power, medium heat (520°F) applications. Best in class when in presence of Oxygen plasma.



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# VACUUM CHAMBER SOLUTIONS

World's broadest portfolio of polymer solutions for use in vacuum chamber applications

## GENERAL TRENDS

- / Increasing energy in plasma chambers
- / More aggressive plasma chemistries, introduction of Oxygen into the chambers
- / Pinpoint material selection on a per application basis to maximize "cost vs. performance"
- / Replacement of polyimide for reduced cost and increased performance
- / Careful use of ceramics & Quartz due to cost & breakage
- / Increased requirements for ionic purity due to reduced node size

## TYPICAL APPLICATIONS

- / Screws & Pins
- / Clamp & Trench Rings
- / Valve Housings
- / Shower Heads
- / Various Etch & CVD Parts



Competitive Quartz (left) is much more brittle than Quadrant Semitron® MPR1000 (right) often chipping in vacuum chambers

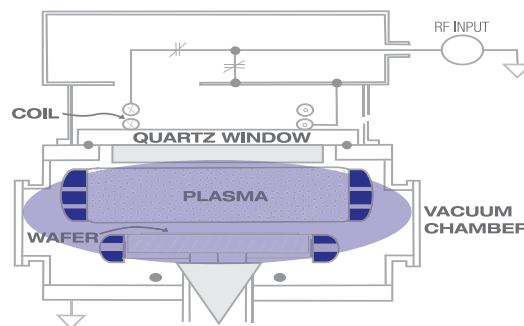
## INTRODUCING: SEMITRON® MPR1000

Semitron® MPR1000 was developed to provide engineers with a viable polymer-based option when confronted with the increasing demands in vacuum plasma based chamber design due to use of Oxygen to clean the chamber and the rapidly increasing electrode power.

## PRODUCT FEATURES

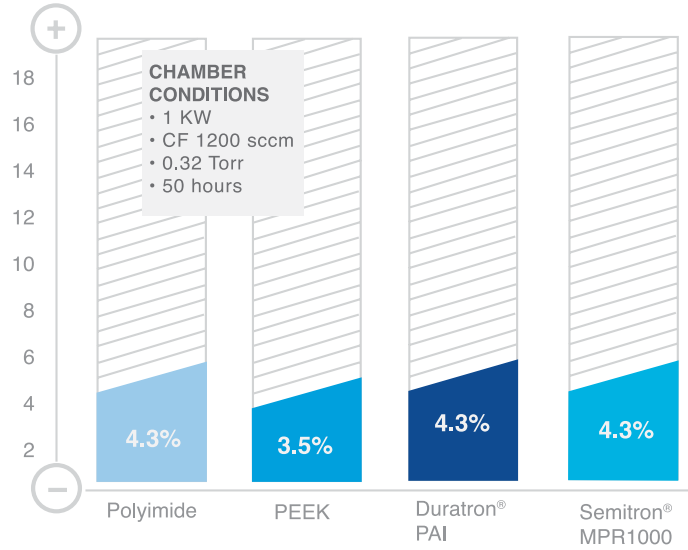
- / Excellent plasma resistance in Oxygen plasma, approaches Quartz
- / 12-25X\* better than polyimide in Oxygen plasma
- / Excellent chip resistance, durability & machinability compared to Quartz
- / Lowest overall cost of any polymer solution
- / Excellent ionic purity

\*Depending on energy level

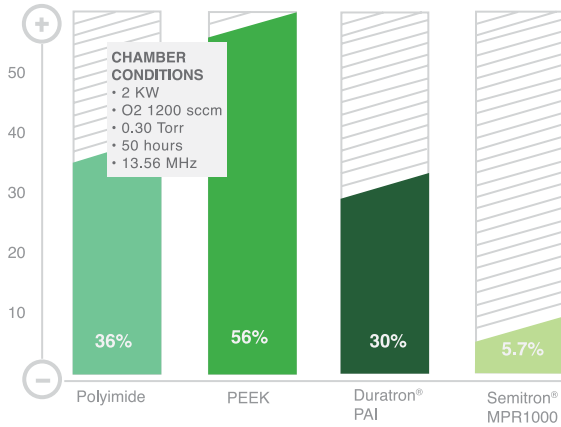


## PERCENT WEIGHT LOSS IN CF4 PLASMA - LOW ENERGY

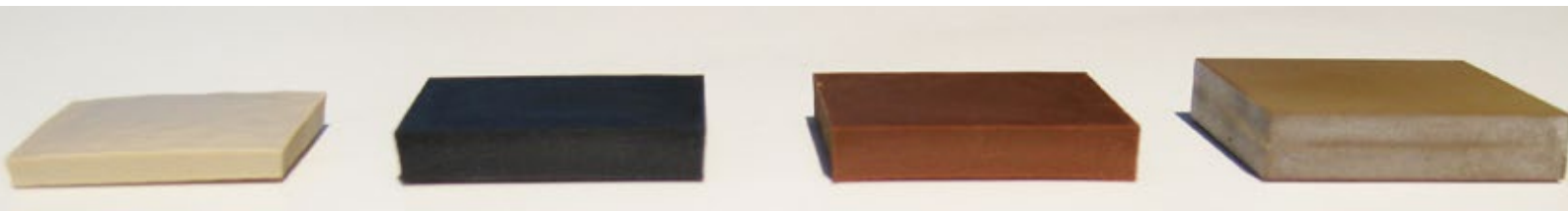
- / Most advanced engineering plastics perform similar in freon plasma gases
- / The mode of degradation is mechanical erosion, a function of surface hardness & type of solid, crystalline vs amorphous



## PERCENT WEIGHT LOSS IN O2 PLASMA - 2KW



- / Advanced engineering plastics mode of degradation in Oxygen plasma is catastrophic oxidation
- / Semitron® MPR1000 was developed to withstand the typical erosion experienced in Oxygen plasma chambers
- / Semitron® MPR1000 displays 10X better results than PEEK and 6X better results than polyimide in a 2KW Oxygen plasma chamber and up to 25X better results than polyimide at 2.5 KW Oxygen plasma



**PEEK**

**PAI**

**POLYIMIDE**

**SEMITRON®  
MPR1000**



# VACUUM CHAMBER SOLUTIONS

World's broadest portfolio of polymer solutions for use in vacuum chamber applications

Ionic Purity Data by Total Digestion*	Semitron® MPR1000	Ketron® PEEK	Standard Polyimide	Ionic Purity Data Adjusted for Mass Loss During Erosion* 2.5 KW · 2000 sccm · O <sub>2</sub>		
				Semitron® MPR1000	Standard Polyimide	
Aluminum (Al)	0.14	0.38	0.47	Al	0.14	17.68
Barium (Ba)	0.07	0.02	0.05	Ba	0.07	1.88
Calcium (Ca)	2.8	8	0.01	Ca	2.8	0.38
Chromium (Cr)	2.6	0.49	0.01	Cr	2.6	0.38
Copper (Cu)	0.14	0.2	0.05	Cu	0.14	1.88
Iron (Fe)	2.3	6	0.36	Fe	2.3	13.55
Lead (Pb)	0	0.005	0.05	Pb	0	1.88
Lithium (Li)	0	0.005	0.05	Li	0	1.88
Magnesium (Mg)	0.3	0.8	0.28	Mg	0.3	10.54
Manganese (Mn)	0.11	0.2	0.02	Mn	0.11	0.75
Nickel (Ni)	0.36	0.42	0.02	Ni	0.36	0.75
Potassium (K)	0.77	1.6	0.13	K	0.77	4.89
Sodium (Na)	4.4	480	0.44	Na	4.4	16.56
Strontium (Sr)	0.04	0.06	0.05	Sr	0.04	1.88
Titanium (Ti)	0.12	0.18	0.05	Ti	0.12	1.88
Zinc (Zn)	0	0.15	0.02	Zn	0	0.75

\* All units measured in (PPM).

## MATERIAL COMPARISON GUIDE

Property	Test Method ASTM	Standard Polyimide	Duratron® CU60 PBI	Ketron® 1000 PEEK	Semitron® MPR1000	Duratron® T4203 PAI
<b>Mechanical Properties</b>	Tensile Strength (psi)	D638	12,500	16,000	16,000	20,000
	Tensile Modulus (psi)	D638	N/A	850,000	630,000	1,200,000
	Flexural Strength (psi)	D790	16,000	32,000	25,000	24,000
	Flexural Modulus (psi)	D790	450,000	950,000	600,000	1,050,000
	Hardness Rockwell	D785	M82	M125	M100	M106
	Water Absorption 24hrs @ 73°F (%)	D570 <sup>(2)</sup>	0.24	0.40	0.10	0.28
	Water Absorption at Saturation (%)	D570 <sup>(2)</sup>	1.5	5.0	0.5	3.4
<b>Thermal Prop.</b>	CLTE (in/in/°F)	E-831 (TMA)	3.0 x 10 <sup>-5</sup>	1.3 x 10 <sup>-5</sup>	2.6 x 10 <sup>-5</sup>	1.5 x 10 <sup>-5</sup>
	Heat Deflection Temperature @ 66psi (°F)	D648	632	800	320	534
<b>Electrical Properties</b>	Dielectric Constant @ 1 MHz	D150	4.2	3.2	3.3	3.68
	Dissipation Factor @ 1 MHz	D150	0.0034	0.003	0.003	0.008
	Dielectric Strength	D149	560	550	480	570
	Ionic Purity		excellent	good	fair	excellent

- (1) Data represents Quadrant's estimated maximum long-term service temperature based on practical field experience.
- (2) Specimens: 1/8" thick x 2" diameter or square.
- (3) Estimated rating based on available data. The UL-94 Test is a laboratory test and does not relate to actual fire hazard.

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