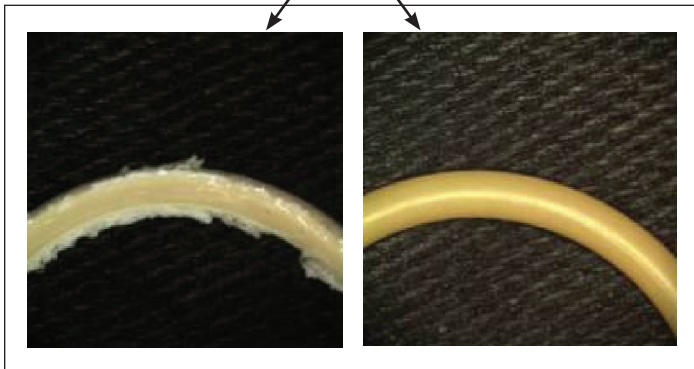


Kalrez® 9100 Parts Reducing Contamination in Deposition Processes

Do your seals look like *this* or *this* during your maintenance?



After 5,000 wafers, Kalrez® 9100 parts showed little evidence of chemical attack (right) compared to an incumbent FFKM (left) in an HDPCVD process using SiH₄, He, O₂ and cleaning chemistry of NF₃ plasma. Test performed by independent laboratory.

Seal deterioration can cause unnecessary contamination, wafer loss and concern. Kalrez® 9100, the latest product from DuPont Performance Elastomers, is proven to help fabricators improve their planned maintenance (PM) schedule, cost of ownership...and more.

Fabs Report Improved Performance With Kalrez® 9100

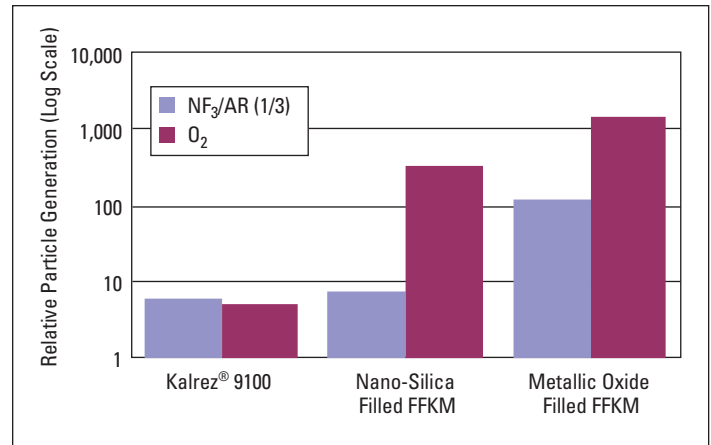
In a number of evaluations at fablines, customers have reported that Kalrez® 9100 perfluoroelastomer parts exhibited less erosion, lower particle generation and longer seal life compared to competitive perfluoroelastomer (FFKM) parts. Kalrez® 9100 parts demonstrated significantly improved wafer production where oxygen and fluorinated plasmas were used during the cleaning cycle. Here are just a few examples of the success Kalrez® 9100 has found in semiconductor processes.

- The PM cycle time extended from 60 to 180 days at a U.S. fabline operating an HDPCVD/STI process. Kalrez® 9100 had no evidence of erosion, leakage, mechanical damage or compression set after 180 days of service.
- At a European fabline in a PECVD process, wafer output increased from 30,000 to >55,000 pairs of wafers in a VAT MONOVAT® application. Kalrez® 9100 showed no evidence of erosion, mechanical damage, compression set or deformation of the seal lip.
- In an oxide etch and dual damascene copper process pendulum valve seal, wafer output increased from 6,000 to 18,000 wafers at a U.S. fabline. No evidence of erosion, cracking or compression set after processing 18,000 wafers.

Kalrez® 9100 Parts Are Designed For Minimal Particle Generation and Metallic Contamination

Conventional perfluoroelastomer sealing materials normally contain carbon black and/or mineral fillers. Newer products are either unfilled or formulated with polymeric fillers like Kalrez® 9100. Plasma resistance can be significantly different depending upon the type of filler used. If the filler has high resistance to plasma, such as BaSO₄, TiO₂, SiO₂, aluminum oxide, aluminum silicate, etc., it can “shield” the polymer to reduce weight loss or erosion, but have the high potential for particle generation by leaving discrete particles behind once the polymer has become etched. Unfilled or polymeric filled products can be etched to form volatiles, thereby significantly reducing the potential for particle generation. Figure 1 shows the relative particle generation of Kalrez® 9100 versus a nano-silica and a metallic-oxide filled FFKM product in different plasmas.

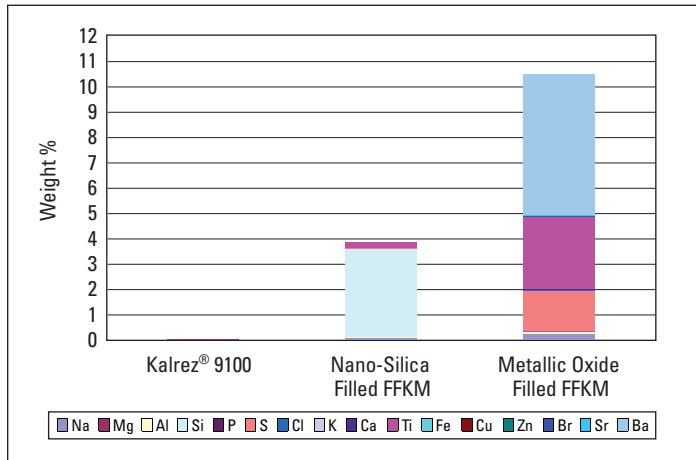
Figure 1. Relative Particle Generation (Log Scale); 6 Hours at 200 Watts, 0.5 Torr, Direct Exposure, Downstream Plasma Reactor



In addition to contamination from particles, metallic contamination, i.e., titanium, copper, magnesium, calcium, iron, etc., is another concern in plasma processes. Metallic contamination can produce negative effects at different levels of CMOS manufacturing. For instance, it can modify intrinsic properties of the film such as the dielectric constant or negatively affect interface properties which are critical for integration.

Plasma can break materials down to atomic or ionic species that can contaminate the deposited layer composition. Conventional mineral filled products contain metallic fillers as primary components, whereas newer polymeric or unfilled products essentially contain no other elements other than carbon, fluorine and oxygen. Thus, sealing materials containing metallic fillers have the potential to generate metallic ions. Figure 2 provides a breakdown of the bulk metallic content of Kalrez® 9100 versus a nano-silica and a metallic oxide filled FFKM product using XRF Analysis.

Figure 2. Bulk Elemental Content Using XRF Analysis



Since purity is critical to high wafer yield, reducing contamination from particles caused by seal deterioration are major goals of semiconductor fabricators. Perfluoroelastomers (FFKM) are widely used in critical seal locations in deposition processes due to their extraordinary chemical resistance and thermal stability. Despite these qualities, FFKM performance can vary widely depending upon their chemical composition. Specially formulated perfluoroelastomer compounds, such as Kalrez® 9100 perfluoroelastomer parts, are designed to reduce contamination while maintaining sealing functionality in aggressive plasma environments.

For more information on this subject, please refer to: www.dupontelastomers.com/semiarticle2/

For further information please contact one of the offices below, or visit our website at www.dupontelastomers.com/kalrez

Global Headquarters – Wilmington, DE USA

Tel. +1-800-853-5515
 +1-302-792-4000
 Fax +1-302-792-4450

Asia Pacific Headquarters – Singapore

Tel. +65-6275-9383
 Fax +65-6275-9395

European Headquarters – Geneva

Tel. +41-22-717-4000
 Fax +41-22-717-4001

Japan Headquarters – Tokyo

Tel. +81-3-6402-6300
 Fax. +81-3-6402-6301

South & Central America Headquarters – Brazil

Tel. +55-11-4166-8978
 Fax +55-11-4166-8989

The information set forth herein is furnished free of charge and is based on technical data that DuPont Performance Elastomers believes to be reliable. It is intended for use by persons having technical skill, at their own discretion and risk. Handling precaution information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Since conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on patents. While the information presented here is accurate at the time of publication, specifications can change. Check www.dupontelastomers.com for the most up-to-date information.

Caution: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your DuPont Performance Elastomers customer service representative and read Medical Caution Statement H-69237.

DuPont™ is a trademark of DuPont and its affiliates.

Kalrez® is a registered trademark of DuPont Performance Elastomers.

MONOVAT® is a registered trademark of VAT Vacuumvalves A.G.