



FILTRATION

Target Market:

Microelectronics

Application:

Chemical Mechanical Planarization
Solution Filtration

Application Description

Integrated circuits are manufactured on silicone, polysilicone or silicon arsenide wafers. Wafers must be perfectly flat (initially and after each layer) to obtain the resolution, sub-micron line widths and precision required. This is accomplished by grinding the wafer with nanometer-sized particles in a liquid slurry. Nanometer-sized liquid slurry is pumped onto the wafers and a polishing pad is used to grind the wafers flat. The slurry used has to contain only the correctly-sized particles. If larger particles are present due to an incorrect size, agglomeration or contamination, scratches are put on the wafer leading to defects and wafer/chip failures. The slurries used have a high particle concentration making them unstable and subject to agglomeration and settling. They also have a tendency to plate out on the drums and piping which can subsequently flake off causing unwanted larger particles. The slurry solutions are made up to the precise specification in a holding tank or drum and then pumped through a filter into a recirculation loop in which there is a filter. The solution is drawn from this loop into the chemical mechanical planarization (CMP) machine through a third filter.

Material: Porous Polyethylene

Types of Filters Used

The most common filters used in CMP applications are cylindrical or pleated polypropylene meltblown cartridges with efficiency ratings from 1 to 40 microns.

Purpose of Filtration

The primary purpose of filtration is to remove particles caused by agglomerated slurry particles and other unwanted contamination. This particulate contamination can create scratches on the wafer surface that result in defects that cause wafer rejection or chip failure. Throughout its life, the filter should effectively remove all particles big enough to cause scratches, but not be so tight (efficient) as to remove the desired slurry particles. Many filters get more efficient during their life due to the accumulation of particulate. This can be detrimental to CMP applications. Some filters remove a broad range of particles above and below their respective ratings. Filters that effectively only remove particles at and above their rating while allowing the smaller particles to pass through are called classifying filters. Ideal for this type of application, classifying filters are particularly effective if they maintain their efficiency over a significant portion of their life.

Common Filtration-Related Problems

- **Filter Plugging** - Premature plugging impedes the flow of slurry causing an increase in efficiency that results in loss of the desired particles, high filter and slurry usage, and imperfect surface finish
- **High Fine Particle Retention** - Loss of the desired nanometer-sized particles caused by tight or plugged filter (or the use of a clarifying filter) creates an increased use of slurry and imperfect surface finish
- **Surface Scratches** - Surface defects caused by particles passing through the filter due to improper sealing, migration, or too large a pore size

Sintered High-Density or Ultra-High Molecular Weight Polyethylene

FEATURE	ADVANTAGE	BENEFIT
Rigid, Omni-Directional Pore Structure		
· Absolute Ratings	· Consistent pore structure minimizes performance changes caused by differential pressure	· Reproducible performance
· Narrow Pore Size Distribution	· Highly-effective surface filtration for particles larger than the filter pore size rating	· Allows for effective cleaning, backwash and reuse
· Thermally-Bonded	· Sintered omni-directional pore structure	· No media migration, bypass or unloading from 5 to 100 microns
· Excellent Chemical and Thermal Compatibility	· High chemical resistance of HDPE and UHMWPE · Completely incineratable with a high BTU output	· No chemical degradation resulting in bypass or contamination of the process fluid · No incineration residue
Unique, Molded Radial Design		
· High Surface Area	· Low pressure drop and higher flow rate	· Increased life or fewer filters results in lower filtration costs
· Open Channels	· Easy access to filtration area	· Effective filtration and cleaning
· Single-Layer Structural Media	· Eliminates unnecessary support materials	· Improves backwash and cleanability
· Rigid, One-Piece Construction	· Multiple diameters, lengths and end configurations	· Easily adapts to existing filtration systems

PERFORMANCE COMPARISON

Rigid, Omni-Directional Pore Structure			Unique, Molded Radial Design		
POREX Radial Cartridge Filter vs	Depth Cartridges	Pleated Cartridges	POREX Radial Cartridge Filter vs	Depth Cartridges	Pleated Cartridges
Micron Rating	= / -	= / -	Backflushable	+	+
Absolute Filtration	= / +	= / +	Surface Area	+	-
Surface Retention	= / +	+	Molded Construction	+	+
Classification Filtration	= / +	+	Rigid Structure	= / +	+
Sintered Process	+	+	Open Pleats	+	+
Polyolefin Material	=	=	Disposal Cost	+	+
Chemical Compatibility	=	=	Performance Priced	+	+
Thermal Compatibility	=	=	Single Material	=	= / +
			Vessel Seal	=	=
			Housing Fit	=	=

Symbol Key: = Porex equivalent + Porex advantage - Porex potential limitation

