

Immersion and Single Wafer Processing

PVA Brush Wafer Scrubbing

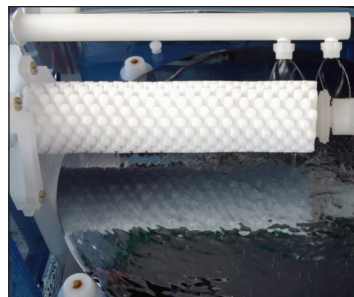
PVA brush scrubbing achieves the highest particle removal efficiency, with rates above 98% at 88 nm and 65 nm. Veeco's patented double-sided PVA brush system cleans top, bottom and side surfaces. Additional PVA brush scrubbing technology is available for single-sided, general fab cleans.

Double-sided PVA Brush Scrubbing

With Veeco's exclusive double-brush technology (US Patent Reissue 36,767), contra-rotating brushes grip and rotate the wafer at higher speed and with a greater force scrub than conventional double-sided scrub systems. Chemical dispensing is through the brush, for cleanliness and uniform distribution of cleaning chemistry. Automatic brush height control maintains position over the wafer with 0.001" uniformity.

In an example of a wafer reclaim clean, with bare 300 mm silicon wafers, processing parameters are:

Chemistry Mixture	SC-1 H2O2 0.9%:NH4OH 0.6%:DI Water 98%+; Ambient temperature
Double-sided PVA brush scrub with SC-1	Rotation speed 400 RPM Squeeze pressure 60 psi
Double-sided PVA brush scrub with DI water	Rotation speed 400 RPM Squeeze pressure 60 psi
High velocity scrub 25 seconds	Nitrogen pressure 40 psi Chemistry pressure 70 psi



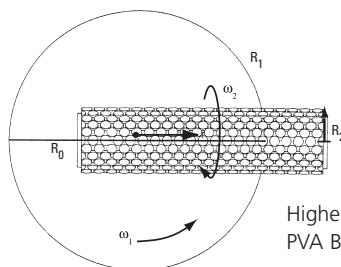
Veeco's unique DSS technology cleans the entire wafer surface quickly and efficiently.



High Velocity Spray

DSS PVA brushing parameter for 99% particle removal efficiency at 65 nm.

Patented, Brush-driven Rotation



Higher Speed, Higher Force
PVA Brush Scrubbing

Torque due to brush friction

is given by:
$$T = \mu \int_{R_0}^{R_1} r (\omega_1 r - \omega_2 R_2) dr = 0$$

Where:

ω_1 =rotational velocity of wafer

ω_2 =rotational velocity of brush

R_0 =radial brush position

R_1 =radius of wafer

R_2 =radius of brush

μ =coefficient of friction

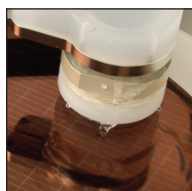
Integrating:
$$R_1^2 \left[\frac{\omega_1 R_1}{3} - \frac{\omega_2 R_2}{2} \right] - R_0^2 \left[\frac{\omega_1 R_0}{3} - \frac{\omega_2 R_2}{2} \right] = 0$$

Solving the equation yields

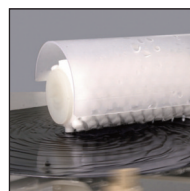
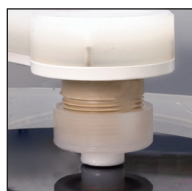
rotational wafer speed:
$$\omega_1 = \frac{3R_2 \omega_2}{2 \left[\frac{R_1 + R_0}{R_1^2 + R_1 R_0 + R_0^2} \right]}$$

Single-sided PVA Brush Scrubbing

PVA scrubbing of the top wafer surface can be accomplished using a rotary brush, with two available pad sizes, or with a single, horizontal brush.



PVA Rotary Brush with 2 Available Pad Sizes.

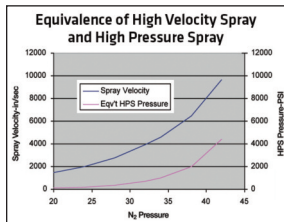


Single-sided PVA Horizontal Brush



High Velocity Spray Scrubbing

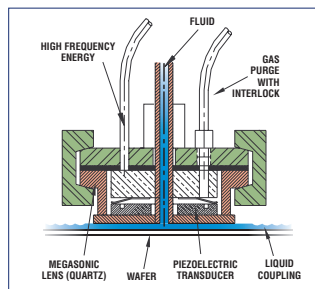
An enabling technology for structured wafer cleaning, the high velocity spray leverages off-the-shelf, low pressure, semiconductor gas and fluid filtration technology. The velocity of the droplets is controlled by the programmable nitrogen pressure; the size of the droplets by the programmable fluid pressure. Both variables, along with other processing parameters, including spin speed and chemistry mixture recipe, are controlled on a per-wafer basis.



High velocity spray is an enabling technology for cleaning structured wafers.

Single Wafer Megasonic Scrub

For the final clean, a short duration duty cycle on a high power pulse megasonic scrub is provided, transmitting the highest power density in the industry. Veeco's patented megasonic scrub utilizes a fluid layer between the lens and wafer surface. The thickness of the fluid layer is an integer number of half-wavelengths of sound in the fluid. For DI water, the distance between the surface of the quartz lens and the wafer surface is set to 1 mm, equal to one wavelength of sound in water at 1.536 MHz.



The pressure waves are perpendicular to the surface immediately under the transducer, and nearly parallel to the surface away from the center of the transducer assembly.

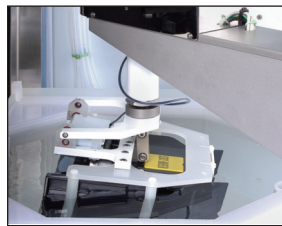


Learn more about Veeco's single wafer process capabilities at www.veeco.com/PSF

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Post-CMP Cleaning

An optional DI water submersible wet input station can be an effective step in post-CMP cleans on wet wafers. This station will keep wafer and slurries completely wet until the final cleaning stage. The wet input station features submersible DI water spraying and recirculation. Veeco systems may also be integrated with CMP polishers as a cluster tool.

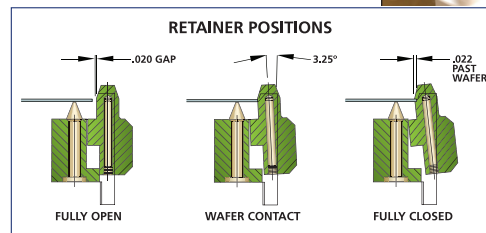
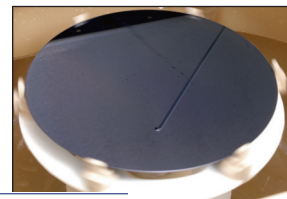


Submersible Wet Input Station

Spot-free Spin Drying

Spot-free spin drying is the final, critical step in producing a defect-free, particle-free wafer. Veeco's exclusive edge-grip spindle tool, with centrifugal grip retainers and PC control of speed—to 3,000 RPM— and acceleration/deceleration, can dry 300 mm wafers in under 30 seconds.

Edge Grip Tooling with Centrifugal Grip Retainers



PC Programmable Chemical Mixing

Per recipe and per wafer selectivity is implemented, featuring closed loop volumetric chemical mixing with standard dilution ratios to 10,000:1. Intermediate dispense vessel washing and drying is provided between chemical mixtures, with the only moving parts being pneumatic valves and flow monitors.

Veeco Systems for Effective, Economical Performance

Veeco systems are available in sizes and configurations suitable for your production requirements. All systems are SEMI® S2-0703E Safety and SEMI S8 Ergonomics Compliant, CE Marked, and ETL Listed.



Precision Surface Processing