Applications for UHP Steam

Water Vapor is a Critical Process Gas

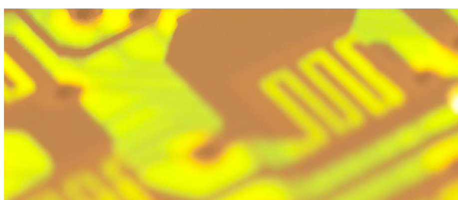
RASIRC reduces costs, improves quality, and dramatically increases safety in the generation and delivery of UHP steam in cleanroom environments.

Traditionally, water vapor for use in semiconductor applications is generated by combustion of oxygen and hydrogen. Several problems arise with this practice, including dangerously high operating temperatures (in excess of 500°C), particle formation, impurities, erratic flow response time, high cost, inability to achieve maximum growth rate and the explosion hazard from burning hydrogen in pure oxygen. RASIRC offers new technology that eliminates these critical issues.

RTP, ALD, Plasma Stripping and Diffusion

Water is often generated as a pyrolytic process to insure the purity of the water vapor. Difficulties with this process include burning of oxygen and hydrogen, the need for external torches on the diffusion chambers to prevent the 800°C heat from changing the thermal profile of the tool, particulation of the torch tip, startup and shut down time, safety issues with hydrogen and excess hydrogen in the chamber. In addition, these systems have a difficult time with very low flows or low water vapor to hydrogen ratios.

RTP needs high flow rates of water vapor for short periods of time. Present catalytic systems are metallic, expensive, have similar safety issues as torches, have problems with rapid cycle times and are not easily scalable due to thermal buildup in the catalytic combustion cell.



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ALD needs very small amounts of water vapor for High K film formation. The purity of water vapor is critical for good film formation. Bubblers cannot control water vapor purity and DLI does not have fine enough control.

Plasma stripping is more effective with water vapor to help lift the film of the wafer surface. The RASIRC Steamer can provide high flow rates of pure water vapor in a controlled fashion.

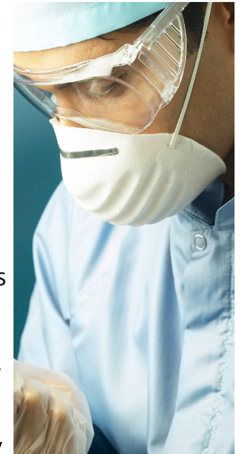
RASIRC provides an inherently safe and ultra pure process for delivery of steam for the oxidation process in diffusion furnaces. This process replaces alternate techniques that are either unsafe due to the explosive combustion of oxygen and hydrogen to generate pure water, or of limited purity and throughput due to the bubbling of nitrogen through water.

Immersion Lithography

Immersion lithography places a layer of pure water between the projection lens and the wafer. Any contaminant within the water can lead to change in refractive index and a project defect on the wafer. Micro-bubbles in the water can also lead to project defects on the wafer. RASIRC delivers ultra pure water at point of use that is ionically pure, particle free, and free of micro-bubbles, providing a competitive advantage to the lithography tool manufacturer. In addition, the urea and ammonia are known to affect optics and tool uptime. Both contaminants can be eliminated or significantly reduced with RASIRC.

Wafer Cleaning

As device feature sizes continue to shrink and aspect ratios increase, the ability to get sufficient energy into the bottom of the trench becomes less and less efficient with megasonics. Steam provides high energy and excellent contaminant removal capability, so is well poised to become the cleaning process of choice for next generation wafer cleaning.



Steam is extremely aggressive at removing molecular contaminants from the wafer surface. From a raw materials standpoint, the use of ultra pure steam, as a replacement for dip and dunk water process for cleaning, could reduce water needs from gallons per wafer to grams per wafer. Existing wafer drying processes could easily be adapted to this cleaning technique and the by-products of the process could be easily handled by existing fab-wide waste management systems.

Steam Cleaning of Flat Panels

As the substrate size increases, the chemical and water bath usage increases dramatically. Steam cleaning provides a very cost effective method for applying and removing chemistry from the wafer surfaces.

Cleanroom Humidity Control

Semiconductor cleanrooms require very tight control of purity and humidity of the air. The humidity of the incoming air is controlled by injecting clean steam during cold and dry environmental conditions. If the steam contains contaminants these get transferred into the air and into the cleanrooms. This has a detrimental affect on yield.

www.rasirc.com
(858) 259-1220 • info@rasirc.com
11760 Sorrento Valley Road, Suite E
San Diego, CA 92121