

RASIRC — The Steam Purification Company

Products for Steam Purification, Humidification and Water Vapor Delivery

RASIRC develops products that purify, humidify and deliver ultra pure liquids and gases, with a primary focus on water vapor. The RASIRC technology includes the first steam purification technology ever brought into the semiconductor market. This technology reduces cost, improves quality, and dramatically improves safety.

Products

The **RASIRC Steamer** combines a clean steam generator and steam purification assembly into a single system. All wetted components in the liquid path are quartz or Teflon®. The purified steam path components are quartz and Teflon® fittings and valves. The **RASIRC Steamer** is proven to increase oxide growth rate, chamber uniformity, film quality, and/or reduce operating cost when compared against all other steam technologies.

- Heater generates steam from DI water.
- A non-porous hydrophilic membrane purifies the steam and diffuses water vapor into the process.
- Flow rate is controlled and automatically adjusted based on upstream and downstream pressure.
- Water levels are constantly monitored and adjusted to ensure continuous steam supply.
- Eliminates hydrogen requirement.

RainMaker Humidifier is the premier device for controlled humidification of clean air or other process gases.

- A non-porous membrane provides a barrier between the liquid source and the carrier gas to be humidified.
- The liquid source rapidly permeates across the membrane, while the carrier gas is excluded.
- Flow stops once the carrier gas has been fully saturated.



Industries and Applications

Ultra High Purity (UHP) steam is of critical importance to many applications and industries:

Semiconductor manufacturing

Steam is used for generating oxide films on semiconductor wafers in diffusion and rapid thermal processing. Next generation films require UHP steam for formation of the high K layer. Immersion lithography requires water that is absolutely pure and bubble free. Dilute water vapor can be added to etch, strip, and cleaning process to accelerate reaction rates. RASIRC reduces costs, improves quality, and dramatically improves safety associated with these applications. Unlike the established pyrolytic process that generates water vapor by combustion of oxygen and hydrogen,



RASIRC proprietary technology starts with de-ionized water, so it operates at lower temperatures, and can help eliminate hydrogen requirement from a process and facility.

Nanotechnology

Improving the growth rate and uniformity of carbon nanotubes is a major hurdle to transfer of this technology from research to production. The process of growing carbon on catalyst leads to self poisoning of the catalyst and cessation of the process. Through the addition of small amounts of water vapor, the catalyst can be kept free of molecular contamination. This enables longer carbon fiber to be grown under the same general process conditions.

Medical and Pharmaceutical

Steam is used for sterilization of almost all components used in manufacturing

pharmaceuticals. In addition almost all the water used for making drugs begins as steam.

RASIRC generates UHP steam that is virtually free of metallic contaminants and volatile gases, unlike other processes that rely on metallic boilers and thereby load the steam with dissolved metals, silicates, and atmospheric gases.

Photovoltaic Cells

Ultrapure steam is needed to form transparent conductive oxide to improve solar energy capture. Steam is being used to grow wet thermal thick oxides on the backside for state of the art current isolation when used with backside contacts. In addition steam can be used to form isolation layers between films and annealing of films to reduce defects and improve cell efficiencies.

Fuel Cells

Contamination in any of the process gases (hydrogen, oxygen, and water vapor) involved in fuel cell development can lead to poisoning of the membrane catalyst and degradation of the proton exchange membrane (PEM). In addition, improper hydration of the PEM degrades performance of the fuel cell. RASIRC high temperature humidifiers allow 100% saturation of hydrogen and air up to 110°C operation.

Humidification of hydrogen and air is currently done with bubblers. Bubblers are limited to below boiling (100°C) and low pressure. RASIRC RainMaker humidifiers can be used with water or steam as the water source for humidification. They can be used to provide humidification at above boiling temperatures and higher pressures. This can enable PEM fuel cells to operate more efficiently.



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