

RASIRC Corporate Overview

Products for Steam Purification, Humidification and Water Vapor Delivery

RASIRC develops products that purify 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

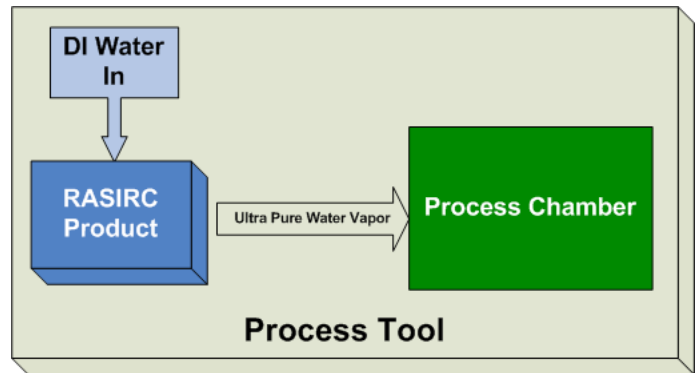
RainMaker Humidifiers—Add ultra pure water vapor to any carrier gas to meet high purity standards. The RainMaker can work with water, water vapor or steam. The amount of water vapor transferred into the carrier gas is limited by the pressure of the carrier gas, temperature of the water vapor source and energy available.



Rainmaker Humidification Systems—Control the addition of water vapor to ozone, nitrogen and other carrier gases from 0.001 slm to 1000 slm. The RASIRC RainMaker Humidification System (RHS) delivers repeatable amounts of water vapor into carrier gases, independent of the process pressure. The RASIRC RHS consists of a non-porous membrane that excludes particles, micro-droplets, volatile gases, and other opposite charged species from being transferred to the carrier gas and ensures only water vapor is added. The membrane is designed specifically to select only water vapor.



Steamers—Deliver Ultra High Purity Steam into a wide range of flow rates and from vacuum to positive process pressures. 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



WATER VAPOR FLOW DIAGRAM

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.

Benefits

- **Increased Throughput**—High flow steam delivery rates of 100% pure steam give the maximum growth possible for any given temperature and pressure.
- **Improved Uniformity and Repeatability**—RASIRC membrane is the only non-metallic flow controller for steam that delivers high flow of 100% UHP steam, which generates the best uniformity possible.
- **Cost Reduction**—RASIRC eliminates oxygen and hydrogen, improves film quality and improves growth rates.
- **Contamination Control**—Unique membrane technology removes particles, ions, dissolved gases and most molecular contaminants from DI water and steam.
- **Safety**—Elimination of hydrogen and oxygen reduces explosion, fire, and high temperatures along with the associated safety equipment and cylinder change out requirements.



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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. Significant improvements in performance and cost can be achieved in thick oxide growth and ultrathin selective oxide growth with RASIRC Steamers. Next generation films require UHP steam for formation of the high K layer. Immersion lithography requires water that is absolutely pure and bubble free. 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 without explosive materials.

Nanotechnology

For repeatable and reliable Carbon NanoTubes (CNT) fabrication, tools are needed to control whether CNT are single- or multi-wall, straight or bent, long or short, and clean or dirty. Water vapor addition to the process is turning out to be the main control knob for all of these processes. Precise delivery of water vapor will determine what the CNT looks like, what its yield is, and how contamination free the structure is. Water vapor is both the gas pedal and the steering wheel for CNT fabrication.

Solar

Manufacturing the highest efficiency cells at the lowest cost is key for the success of photovoltaic devices. RASIRC ultrapure steam can be used for growing oxide layers, transparent conductive oxides, device annealing, and back contact insulators.

Medical and Pharmaceutical

Steam is used for sterilization of almost all components used in medicine, surgery, and pharmaceutical engineering, and 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. Many critical pharmaceutical processes require precise control of humidity. RASIRC humidifiers and humidity control systems are the best solution for precise addition without risk of direct water to process gas contact.

Fuel Cells

Contamination in any of the process gases (hydrogen, oxygen, and water vapor) 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 115°C operation.

Quick Facts

- Founded in March 2005 by successful entrepreneur with long-term experience in semiconductor industry.
- Privately funded.
- Several patents pending.
- Global Sales and Service.
- Focused on product innovation for emerging markets.

Purification Performance Results (ppb)			
	DI Water Source	Pre-Purified Steam	Purified Steam
Total Metals	19.8	0.15	0.009
Total Organic Carbon	1200	380	22
Total Silica	28	4.3	0.7
Urea	2200	48	2.6
Ammonium	1.468	1.117	0.116



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