

Competitive Advantages of Ontos7 Atmospheric Plasma

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Advantages of Ontos7 Atmospheric Plasma Process over Vacuum RIE Plasma for Die/Wafer Surface Preparation

- Ontos Atmospheric Plasma is NOT intended to etch surfaces, it performs a surface modification process on the very top layers of the substrate.
- Atomic layers are modified by activated gas-phase chemical reactions, not blasting the surface with reactive ions.
- Eliminates the potential for vacuum plasma damage to the substrate –
 - NO direct exposure to hot electrons, ions, or high kinetic energy bombardment.
- Eliminates the possibility of back-sputtering of unwanted metals from vacuum chamber components onto the substrate being treated.
- Eliminates the introduction of particles from vacuum chamber walls.
- Eliminates the possibility of re-deposition of etch products back onto the substrate being treated.

- Eliminates the possibility of cross-contamination of different materials or processes running on the same apparatus. No chamber walls to load up with etch by-products.
- No chamber “seasoning” required when changing processes.
- Speeds up process thruput by eliminating pumpdown time.
- Capable of continuous-feed process (vs. batch processing in a chamber.)
- Eliminates expensive and time-consuming maintenance requirements of vacuum equipment.
- Additionally, and very significantly, the vacuum plasma clean method only removes oxidation from metallic surfaces very temporarily, since the oxide re-grows rapidly when exposed to air after the chamber is vented. If subsequent processing cannot be performed in a very short period of time after venting, the re-grown oxide inhibits subsequent processes on oxidized metal surfaces. Ontos7 employs patented passivation technology to inhibit re-oxidation of metal surfaces for many hours.

Note: Inexpensive (roughing pump only) vacuum plasma ashing systems are not suitable for surface preparation with reducing chemistries because they cannot pump out enough oxygen from the chamber to allow the reducing chemistry to act on the surface of your wafers. In comparison, the Ontos7 Atmospheric Plasma system uses a continuous flow of process gas in a small reaction zone to ensure zero Oxygen in the reaction zone.

Reducing chemistry for “descum” is highly effective, since it easily removes organic residue; and at the same time, the reducing chemistry de-oxidizes exposed metal surfaces (as opposed to more deeply oxidizing them with a conventional ashing system) This is extremely valuable for descum that is to be followed by metal deposition, wet etching, or plating.

In cases where oxidizing chemistry is required, Ontos7 is equally capable of superior performance.

Advantages of Ontos7 Atmospheric Plasma Process over Competitive Atmospheric Plasma Products for the Preparation of Semiconductor Surfaces

- Ontos7 plasma head is specifically designed for handling both reducing chemistry and oxidizing chemistry.
- Ontos7 has a strong advantage over competitors with a much broader range of operating parameters such as gas flow rates, gas ratios, and RF power.
- Only Ontos is pursuing large-format glow discharge plasma heads (160mm, 200mm, 300mm) for use in the Semiconductor Industry.
 - Design optimizes semiconductor processing capabilities.
 - Many features of this new design are patentable.
- Ontos7 plasma is stable and never arcs. Arcing in competitor's plasma occurs often and not only changes the downstream chemistry, but produces particles and eventually destroys the plasma head.
- Ontos7 provides 4 mass flow channels as standard equipment for process flexibility.

- Ontos7 head and scanning system have been designed specifically for the semiconductor industry, so as to not introduce particles onto the substrate.
- Ontos7 employs upstream glow discharge plasma, which we have demonstrated as safe for CMOS and other sensitive devices.
 - Many competitors utilize arc discharge or corona discharge technology which are not CMOS-safe. These technologies typically produce extreme gas temperatures. Ontos7 gas temperature is <math><100^{\circ}\text{C}</math>.
- Ontos7 has a linear aperture for greater uniformity over large substrate areas.
- Ontos7 system has been designed for ease of use in semiconductor applications such as scanning chips and wafers.
- Ontos7 employs patented passivation technology to inhibit re-oxidation of metal surfaces while in queue.

- Ontos7 capabilities have been proven for Indium, Nickel, Copper, Tin, Silver, and alloys of these popular contact materials, for semiconductor applications. Results have been presented at prestigious electronics industry conferences and published in conference proceedings.
- Ontos7 has also been demonstrated as a highly effective surface activation treatment on photoresists, oxides, nitrides, semiconductors, and metals.
- Ontos engineers are participating in ongoing research into 3DIC stacking materials and processes with strategic partners.
- Ontos personnel have over 130 years of experience specifically in the semiconductor processing industry. We understand your needs and limitations, and have a very strong working knowledge of processes, diagnostic tools, associated frontend and backend process equipment, yield, thruput and cost within this industry.