Special Plastic Module for semiconductor industry

S.P.M. s.r.l.

Quartz Treatments

Preamble

Process chambers used in semiconductor industry (thermal processes APCVD, LPCVD) require preventive maintenance and this means cleaning.

After a certain number of processed wafers (oxidation/ deposition) the process chamber must be extracted from the furnace and must be cleaned. Cleaning eliminates waste and residuals that are on the process chamber walls. Process after process, dirt reaches a max. level and the process purity degree cannot be assured any more. At this point the process chamber must be cleaned before re-use.

A cleaning process presents some critical aspects:

- *uniformity:* all parts must be cleaned in uniform and complete manner
- *contamination:* the clean up process must eliminate all dirty layers without contaminating parts; this means you cannot use fluids that can be dangerous for the process following the cleaning step. Be careful to contamination coming from precedent clean ups (doped / not doped processes). For this reason, parts that need a doped process will be cleaned into a specific equipment
- *mechanical:* usually parts to be cleaned are in quartz (in some cases in silicon carbide) and are quite fragile. Their handling is critical and quartz tubes are huge and heavy
- *managerial:* parts that compose a process chamber can have different shapes and the cleaning equipment must take into consideration the specific shape and dimensions of parts to be cleaned
- After the clean up process, the process chamber is positioned into the furnace, then a test is executed (wafer process and defect control).

Quarts Treatments

EPI Quartz Cleaning

Oxidation/Doping Quartz Cleaning

Quartz Handling

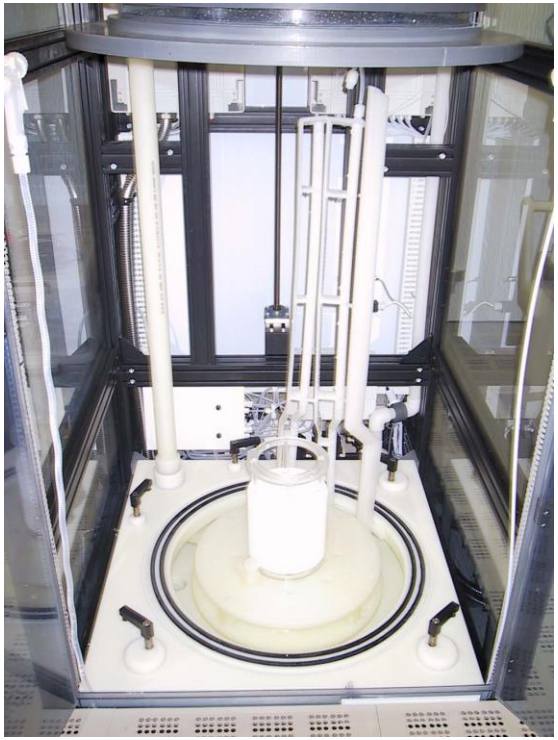
Quartz Storage

CLEANING PROCESS:

- The traditional cleaning process utilizes a chemical etch (typical acids: hydrofluoric acid and nitric acid). Parts that come in touch with acid solution in immersion/ spray version then must be rinsed and put into a stove for drying and degassing.
- Immersion or spray versions are both valid; the choice depends upon equipment design and parts to be cleaned.
- Usually, **immersion** laps all surfaces in an uniform way, but sometimes there are stagnations, air pockets and it needs great volumes of acid.
- The **spray** version saves acid consumption but sometimes lacks in uniformity.
- We often suggest to combine both versions, or to choose one according to the part to be cleaned.

VERTICAL QUARTZ TUBES CLEANER

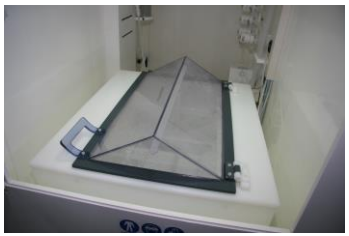
The vertical cleaning is based on spray clean up. Parts are positioned into a special tank, equipped with spray nozzles that deliver acid. To uniformly distribute the solution, tubes are rotating thanks to an electrical motor.



Up/DW Vertical quartz cleaner for short tubes

Vertical quartz cleaner for high tubes up to 2300mm

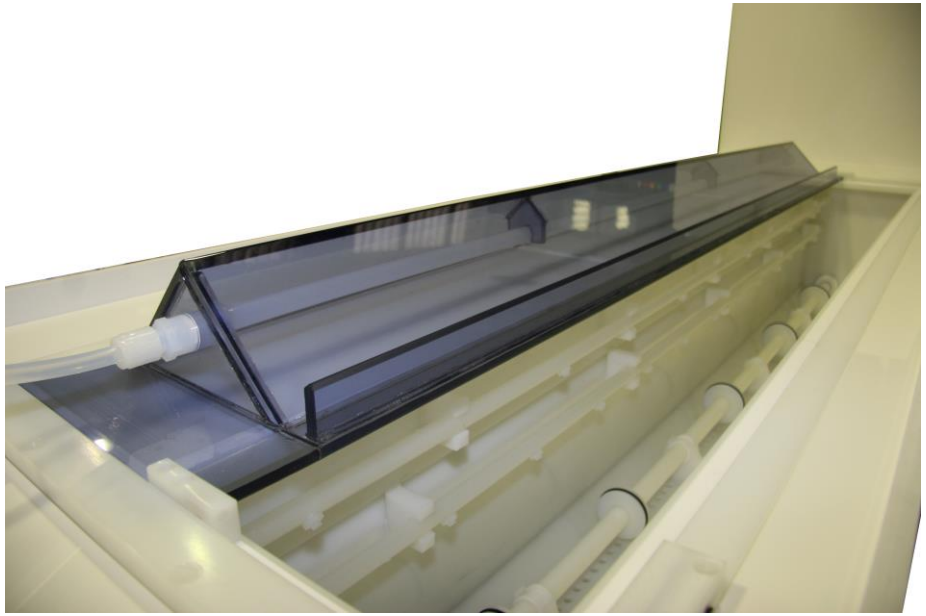
Vertical Quartz tubes cleaner



Malta Model: Vertical quartz cleaner for high tubes up to 2300mm - installed at MEMC Novara ITALY

HORIZONTAL QUARTZ TUBES CLEANER

The horizontal cleaning is a synonymous of immersion clean up. The fact is that immersing 8" or 12" quartz tubes means huge tanks and a great volume of acids, because the whole tube must be in contact with the acid solution. Moreover, the traditional horizontal version presents some problems for stagnation (for gravity reason, the fluid has difficulties to drain completely). To avoid this, it's possible to position the quarts tube in slope version.



Horizontal Quartz tubes cleaner

Venice Model: Horizontal quartz cleaner - installed at STPE Alger AFRICA

HYBRID: HORIZONTAL & VERTICAL QUARTZ TUBES CLEANER

The hybrid version consist in an equipment capable to perform the quartz tube cleaning with possibility of static/ recirculation immersion and spray cleaning at the same tank.

This equipment cleans either in vertical spray version, or in horizontal version; with static clean up (with recirculation or not) + contemporaneous spray clean up.

Hybrid Quartz tubes cleaner

Malta Model – HYBRID VERSION: Vertical & Horizontal quartz cleaner - installed at STMicroelectronics Agrate ITALY

MAIN REASONS TO BUY A QUARTZ CLEANER EQUIPMENT:

Considering processes of 8" and 12", the automatic quartz tube clean up is an important matter, because quartz tubes are the process environment.

For this reason, more and more Companies are now asking for innovative cleaning equipment: clean up is a critical step of their production.

ADVANTAGES of SPM EQUIPMENTS:

- Process repeatability
- Low contamination
- Chemical consumption reduction
- Less money to buy chemicals instead of prepared solution
- Increase Quartz tubes lifetime with less manipulation and shocks
- Environmental friendly: low chemical, electricity and exhaust consumption
- Operators safety
- Easy to use
- Economical
- Low maintenance needed
- High level of cleaning
- No wasting time for operators: processes totally automatic.
- High System Flexibility

QUARTZ CLEANER EQUIPMENTS MAIN FEATURES:

Hermetically closed environment

Chemicals recovery and re-use

On-line solution preparation (with chemical drawing directly from CDS) to obtain the desiderate mixture of HF + HNO_3 + H_2ODI fully settable by touch screen recipes.

HOT H_2ODI for final rinse produced on-line by the system.

Drying accomplished using HOT N_2 produced on-line.

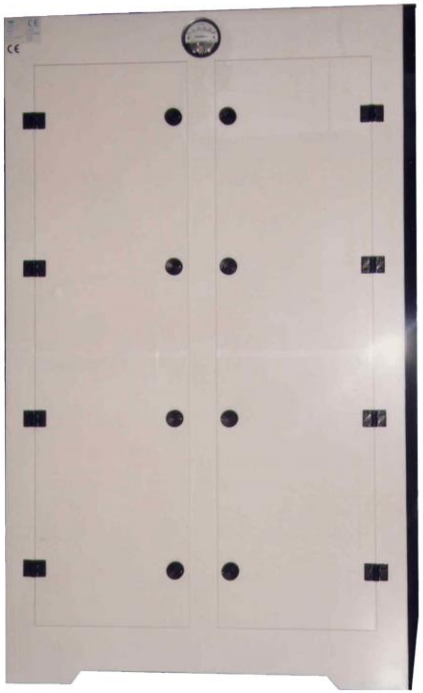
Total absence of metal parts: No contamination

General control is ruled by OMRON PLC and touch screen, with easy and powerful software interface.

Quartz Handling

SPM can realize custom trolleys and system for quartz parts, tubes, boats, chambers… transportation. SPM can provide also automatic systems to easy load tubes into quartz cleaners equipments.

Quartz Storage



SPM can realize custom storages to depose in order quartz parts, tubes, chambers…

N2 pressurization ensure the perfect humidity grade conservation and low ambient contamination.

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Special Plastic Module for semiconductor industry

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