450mm Wafers

Single Wafer "Floating Process"

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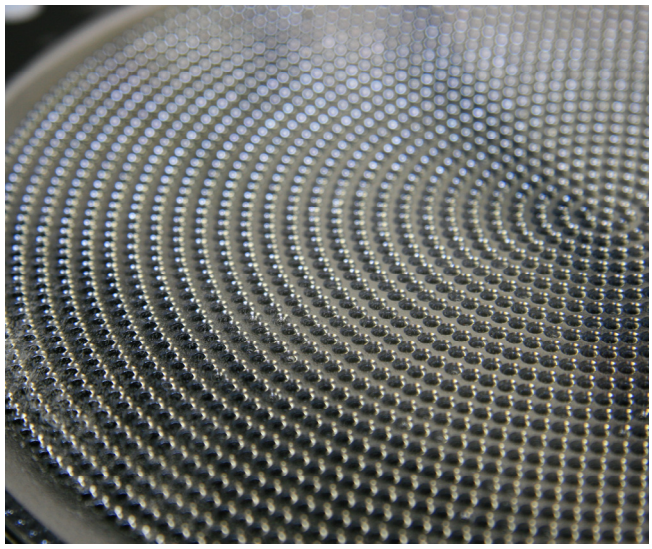
To go on with the various experiments to find always new business opportunities and after developing new equipment for single wafer, PV cells and substrates treatment we've dedicated our efforts in finding a solution for the treatment of the Si wafer of 450mm.

We found new way of processing single wafer that we called: "Floating effect". This way is obtained thanks to a centrifugal pump that spread the chemical solution from the bottom of the tank to the top. Then the liquid reach a special disc and the flow change immediately its direction moving on the edge of the disc. That phenomenon creates particular waves that come out around the disc. A secondary disc (called diffuser) is placed after this. This diffuser has more or less the dimension of the wafer-solar cell-substrate you are using and it's full of high precision holes arranged concentrically. Waves arrive in a strong way on the bottom plane of the diffuser, but they are immediately cushioned passing through the small holes.



This creates on the top plane of the disc a "liquid pillow".

This particular effect permits to liquid to keep a constant level and a perfect homogeneity of chemical distribution.

With the floating technology used for wafers 4"-8", for the Si cells 125x125 and 200x200 and for substrates 5"x5", we have found a very interesting and positive solution for Si wafers 450mm. Of course with this floating single face technology it will be possible to do all the processes for Semiconductor manufacturing, like: oxide etch, metal etch and electrolytic processes.

PATENT PENDING

Front-end PROCESSING

04 May 2016

Special Plastic Module for semiconductor industry

COMPOSITION

The typical workplan is composed by:

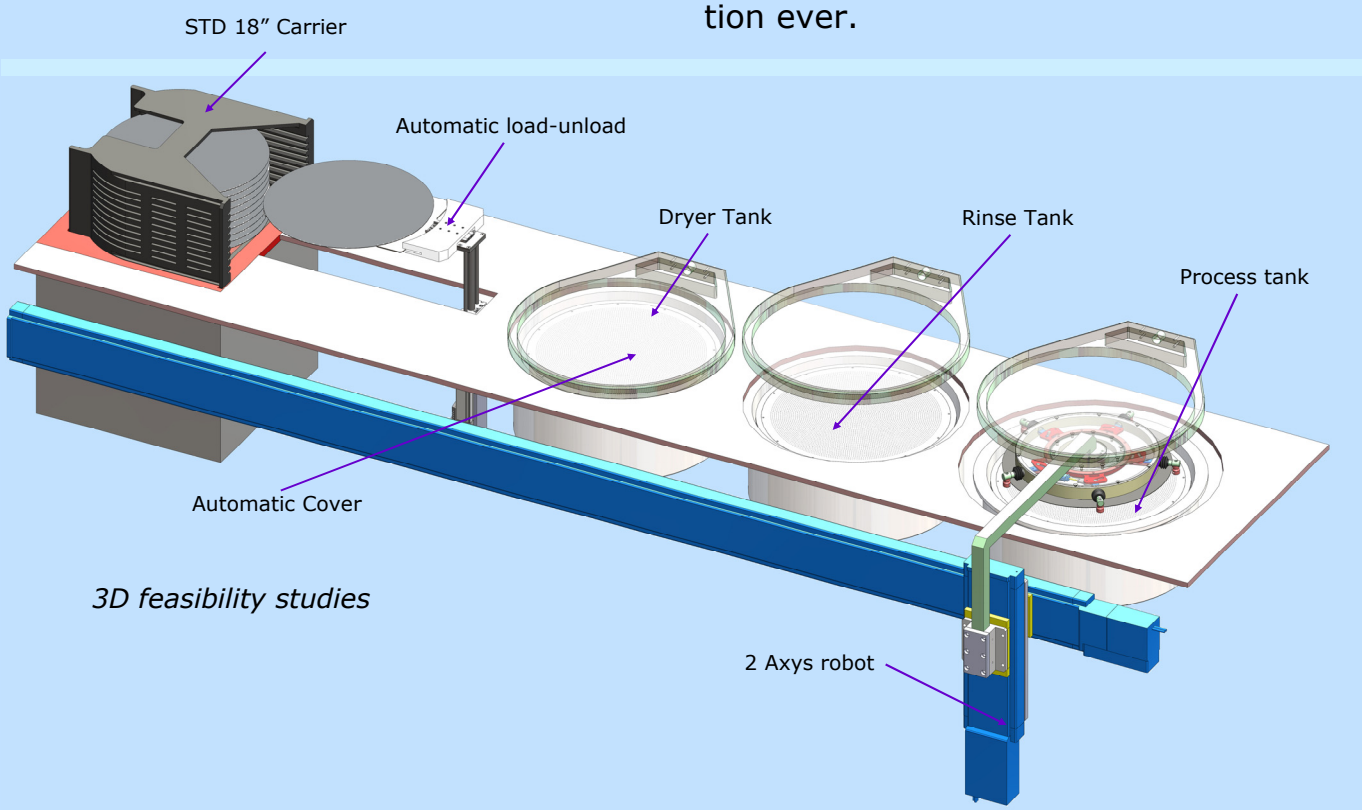
- N. 1 load/unload station (multiple carriers management option)
- N. 1 process tank (RT-MT-HT)
- N. 1 rinse tank, spray version – double face cleaning with resistivity control
- N. 1 Dryer unit with hot N2 spray system

According to process needs it's possible to add virtually infinite stations to the line.

Robot handles wafers between stations according to recipe settings with fast but smooth movements that warrant both no vibrations and high productivity.

No standard configurations are mandatory. SPM always build equipment based on customer requirements. We can develop with you the perfect equipment you desire.

Equipment structures is made with FM approved plastic material to be fitted in certified clean rooms. All used components are proven of metal parts or covered with high tech and high purity materials to warrant the lowest contamination ever.

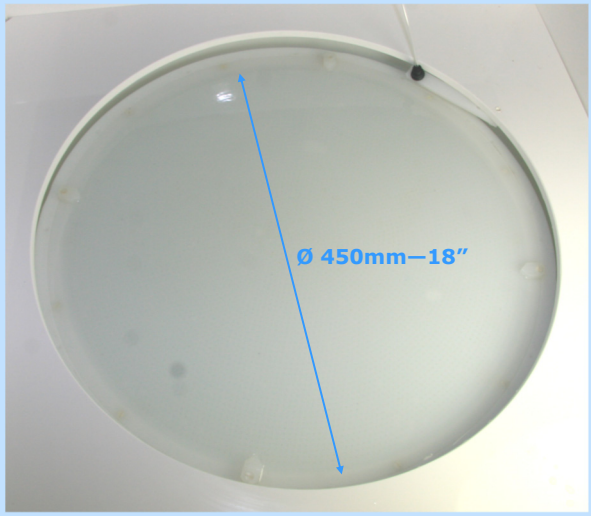


3D feasibility studies

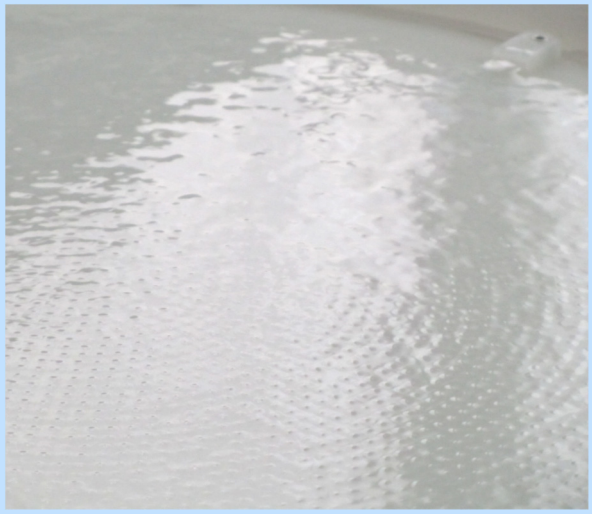
450mm Wafers Production Line

TYPICAL FLOW CHART

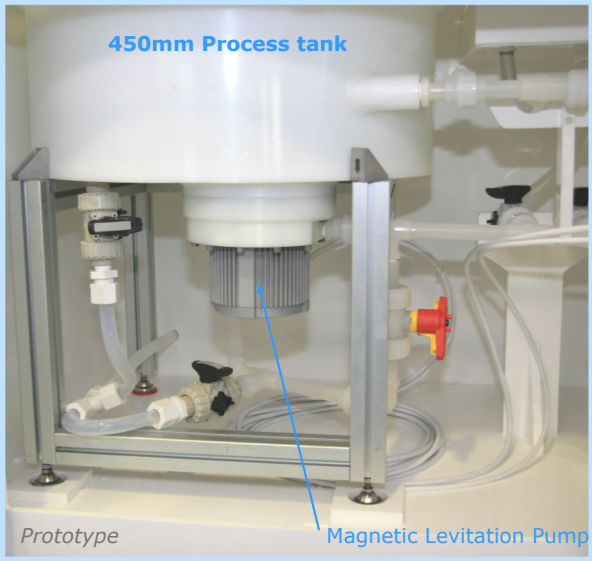
1. 450mm Carrier loading by operator
2. Automatic wafers counting system detects first wafer catching position
3. Pick&place system withdrawal 1 wafer from the carrier and wait for main robot catching.
4. Main robot catch the wafer using custom designed gripper
5. The single wafer will be deposited in process tank by the robot
6. Start of solution recycle from the bottom to the top and diffusion of the liquid in a uniform way through a diffusion plate with many micro-holes. With this solution there will be only one side of the wafer at contact, without masking need.
7. After the pre-set process time, the wafer will be moved in rinse up tank. This will be done at both sides by specific spray systems
8. After the pre-set time the wafer will be transferred to dry unit. The drying will be done in spray version with Hot N2.
9. At cycle end, wafer will be moved in unload station and the pick&place system will move the wafer in the previous slot of the carrier.



Diffuser Plate



Details of diffuser plate with micro-holes



Magnetic levitation pump installed directly on tank bottom.

ROBOT

Robot has been studied placing it on front part of the production line for easy maintenance operations and better results in terms of processes contamination.

Robot configuration includes 2 servomotor axis controlled with two servo drivers that warrant High-accuracy positioning with fully-closed control.

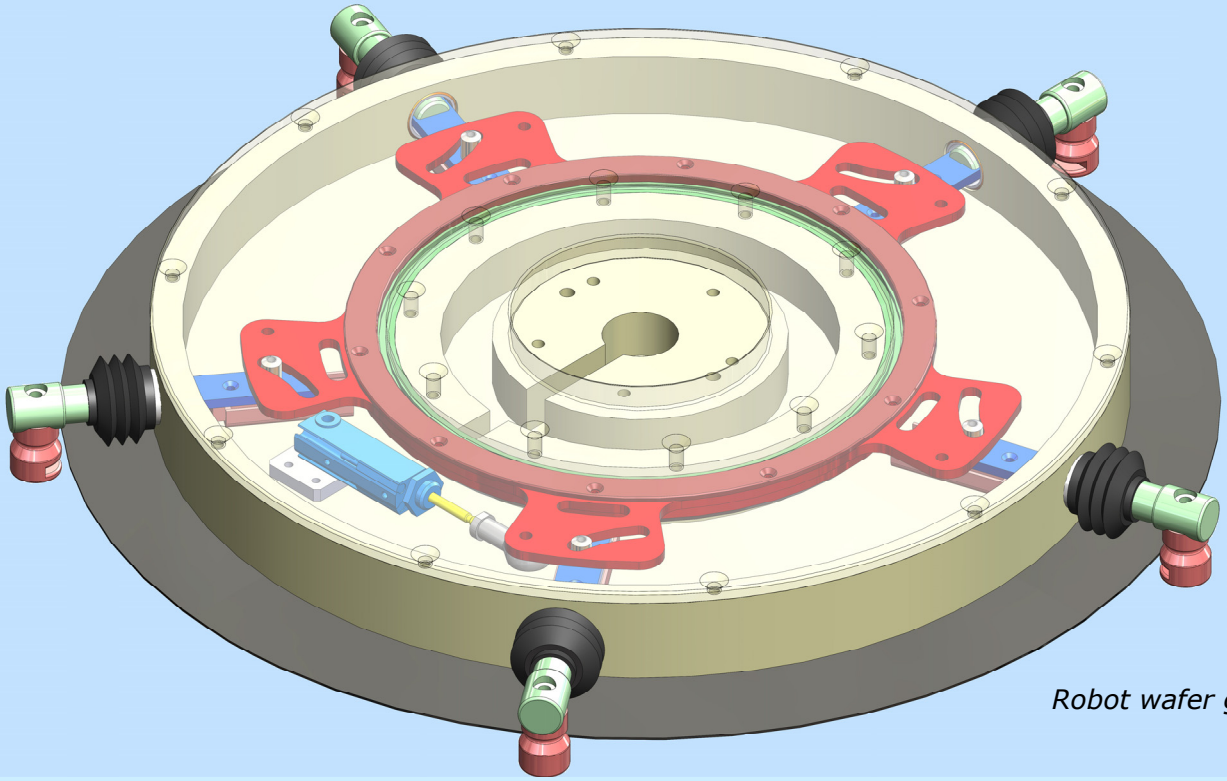
Since 450mm wafer disk needed to handled sensitively and reliably, we design a specific gripper capable to catch firmly 450mm wafer with an extreme reduced contact area. Gripper body is realized in ultra-pure plastic materials that warrant lowest processes contamination.

Robot stainless steel arms are covered by a thin film of PFA ensuring highest purity grade ever.

Thanks to SPM experience in developing motion software we can ensure high flexibility and reliability on machine behaviors.

OMRON advanced PLC controls all automation phases coordinating process, rinse and dryer stations functions at the same time.

Safety is at first point for us. Safety control circuits are constructed with the servo drive, delivering both safety and productivity.



Robot wafer gripper

PROCESS TANK

The process tank could be realized in several materials: lathering a PTFE cylinder, soldering a PE sheet, SS316L and others. PTFE material is electrochemically, biochemically, enzymatically, and **chemically virtually inert** so it is ideal for all chemicals solutions.

The cylindrical shape is necessary to obtain the "pillow effect" and to warrant a very low particle deposition on tank walls, since there are no welding points and edges as on squared tanks.

A surrounding cylindrical tank (overflow) collects the solution and route it to the centrifugal pump.

The centrifugal pump integrates a filter to ensures that eventual debris coming from chemical etch will not block diffuser holes.

Solution can be heated/chilled up thanks to different heating/chilling solutions.

For *electrolytic processes (OPT.):* A Platinated titanium net (anode) is placed before the diffuser and specials contacts are fixed on the cover (cathode). When the cover closes the wafer will start to reach the current generated from the power supplier.

Cylindrical Process Tank

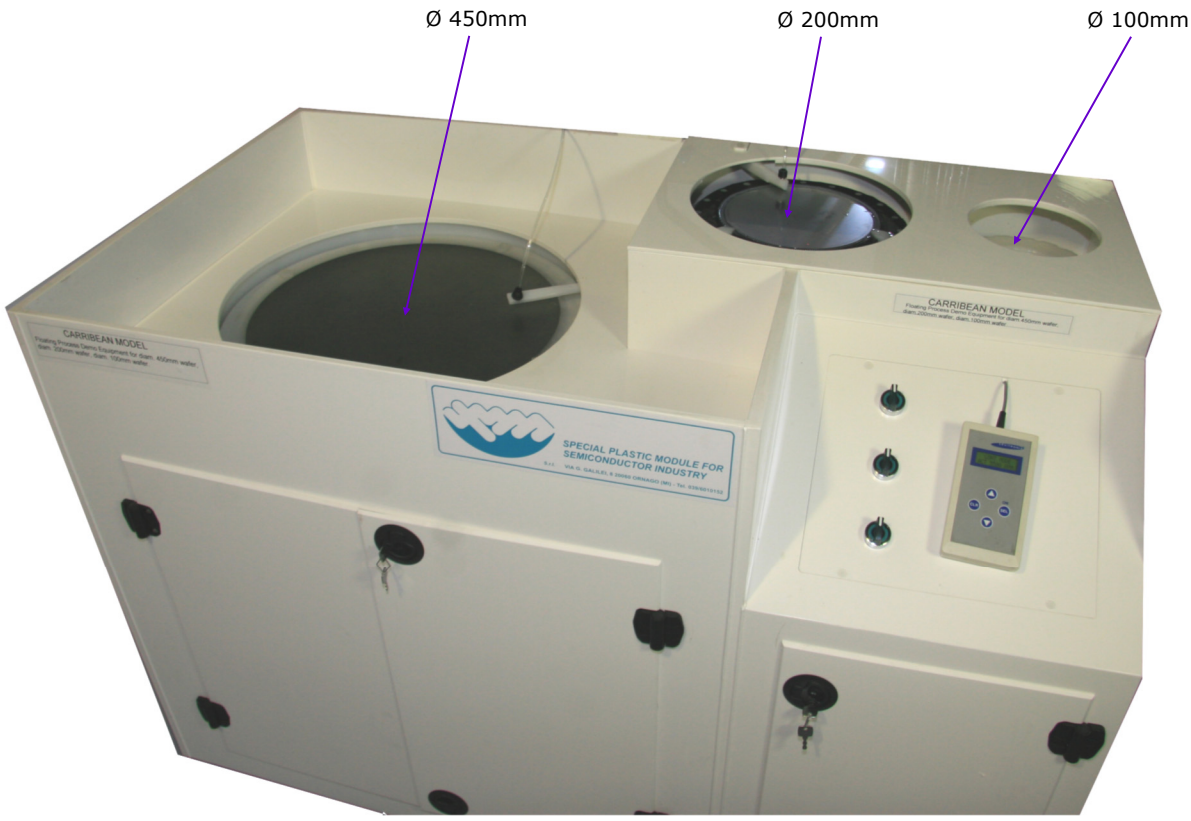
It's also possible to add the rotational featuring (OPT.) to the wafer while processing to improve chemical distribution effect. That is really simple since the wafer is floating on liquid and with just a small N2 flow it start rotating easily and without any friction.

Wafer rotational feature with air-flow

COVER

The tank is equipped with special automatic cover. When cover is closed, the wafer front side comes in touch with the solution. The back side is totally not affected with the process because of the floating effect that protects it from the contact with the chemical solution.

450mm Wafers Production Line



DEMO-Testing prototype for 450mm, 6" and 4" wafers.

For further information don't hesitate to contact us!

Special Plastic Module for semiconductor industry

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