Single wafer spin coaters

www.spincoating.com

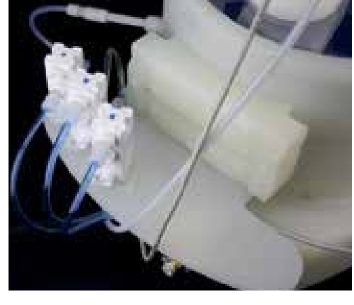
Are you ready for the future?

When it comes to spin process applications, the possibilities are endless. Where today's requirements may stop at a simple clean & rinse program on a 4" substrate, tomorrow's process may require mask cleaning, or a coating step for fragments. The POLOS single wafer processor offers a solution to your current and future applications.

Each individual in fabs, research labs and universities employs different processes. That is why the POLOS Series offers **unlimited options** to choose from: intuitive programing on the touchscreen controller, freedom to upload and download from a PC (via USB), and access to unlimited programs/ steps and graphical representation.

The digital motor speed controller enables accurate acceleration and stable rotations: critical factors for **coating uniformity.**

The versatile, high-quality, all plastic POLOS single substrate spin processors are specifically designed for R&D and low volume production in the MEMS, semiconductor, PV, microfluidics fields. They are suitable for all typical spin processes: **cleaning, rinse/dry, coating, developing and etching**. Various models are renowned for their versatility, processing a wide range of substrates from small fragments up to Ø 300 mm substrates. We even offer units for flat panels up to 670 mm square (900 mm diameter).



We use **NPP-H** with α-crystalline properties for our spin processors and chucks. Natural polypropylene offers improved rigidity, in addition to increased toughness. In fact, the level of rigidity measured at 100 °C is twice as high as that of β-nucleated polypropylene. At low temperatures, it displays higher impact resistance than standard NPP-H, thus combining greater functionality with improved safety.

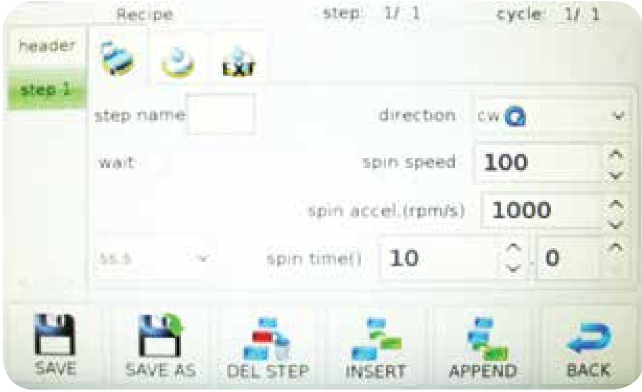
Benefits:

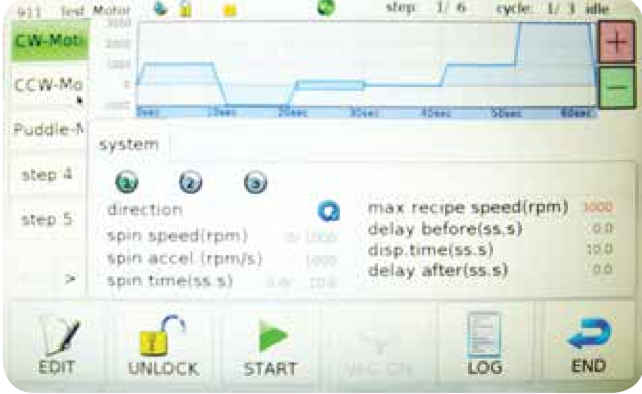
- Finer and more stable alpha crystalline structure
- Superior notched impact strength and enhanced rigidity
- Longer service life
- Improved chemical resistance and superior stress crack resistance

Where the application requires **PTFE,** we use TFM™ 1600. It is superior for use with chemicals compared to standard **PTFE**; its higher material density lowers the chemical absorption rate.

Liners are available in **PET** (Polyethylene terephthalate), 0.5 mm thick, transparent and antistatic (108 - 1010 Ω) to prevent possible static charge build-up in the chamber.

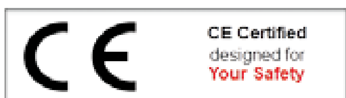
Clear view of your process





Tempered glass lid does not haze or scratch. It remains clear, making it easy to see your process.

Labyrinth seal protects the motor and control electronics from chemical contamination.



***Depending on substrate size and chuck type**

System Benefits:

- High speed and acceleration up to 0 - 12,000 rpm in 0.3 sec*
- Maximum acceleration of 30,000 rpm/s.
- Detachable touch screen control panel for use outside a glove box.
- Programmable CW & CCW rotation for specialty processes such as “puddle” develop and/or etch.
- Full-engineered plastics only, high quality seamless fabrication.

Durable hinges secure the lid at an optimum angle for **easy** access, and for operator **safety,** electromagnetically lock until the end of process, 0 rpm or in of the event of a power failure.

V-Lid ensures that residual chemicals on the lid run safely into the system drain.

Syringe holder & diffuser for **N_2 purge** enable a uniform purge with reduced air turbulence in the chamber.

SPIN150i - SPIN200i

The SPIN150i & SPIN200i spin processors are advanced systems that offer precise, repeatable process control. An aerodynamically efficient chamber enhances uniformity, while the natural polypropylene or PTFE construction ensures a metal-free, contamination-free process area that is easy to clean.

- Programmable CW & CCW rotation
- Spin speed 0 rpm - 12,000 rpm, accuracy +/- 0.1 rpm
- Acceleration / deceleration 1 - 30,000 rpm/sec, selectable per step

SPIN150i

SPIN200i

The SPIN150i & SPIN200i are small-sized footprint systems with the capacity for up to 6” wafers (SPIN150i), or up to 8” wafers (SPIN200i). They are pre-configured with a nitrogen purge nozzle/syringe holder. The SPIN150i comes with a chuck and fragment adapter, which will hold a wide range of substrates, from small pieces (minimum Ø 10 mm area) up to 6”.

The SPIN200i comes with a chuck that will hold from 4” to 8” wafers - or can alternatively be specified to have the same chuck and adapter as the SPIN150i model. (Chucks for 6” wafers and below can be used on either model.)

The SPIN150i & SPIN200i offer exceptional value and capability: precision speed range of up to 12,000 rpm, programmable in 1 rpm, for CW, CCW rotation (ideal for “puddle” develop), and per-step acceleration of max. 30,000, also programmable in 1 rpm, to cover any process requirement. Time: from xx h to 0.1 sec. It is programmed through an easy-entry color touchscreen. The self-explanatory icons make it easy to operate even for new users.

A quality choice for the long-term, the SPIN150i & SPIN200i are designed and manufactured in Germany.

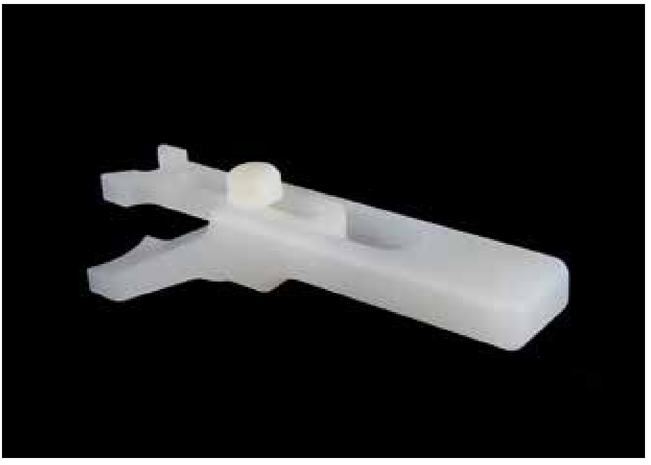
Specifications SPIN150i - SPIN200i

Specifications	SPIN150i	SPIN200i
Available number of programs:	Unlimited*	
Steps per program:	Unlimited*	
Spin speed:*	0 - 12,000 rpm** +/-1 rpm/sec.	
Spin speed accuracy:	± 0.1 rpm **	
Spin rotational direction:	Clockwise, counter clockwise and puddle	
Max. acceleration:	30,000, programmable in 1 rpm	
Spin time:	from xx h to 0.1 sec.	
Free programmable outputs:	3 pcs, relays, nominal switching capacity 0.5 A /125 VAC - 0.3A / 60 VDC	
System data		
Housing material:	Natural polypropylene (NPP)***	
Process chamber material:	Natural polypropylene (NPP) or high chemical resistant PTFE (TFM™)	
Interface:	Detachable, full-size touchscreen, glove friendly, IP52, chemical resistant	
External connection:	1 USB port in the controller	
Max. substrate diameter:	160 mm round or 4" x 4" square	260 mm round or 6" x 6" square
Max. process chamber diameter:	202 mm	302 mm
Dimension (desktop version):	274 (w) x 250 (h) x 451 (d) mm	380 (w) x 307 (h) x 559 (d) mm
Shipping weight:	14 kgs	20 kgs
Shipping dimensions:	600 x 380 x 360 mm	680 x 580 x 480 mm
Requirements		
Voltage:	100 - 120 VAC / 200 - 240 VAC 50/60 Hz (auto select) Max. 500W	
Power consumption:	5 A / 2.5 A	
Max. current:	- 65 kPa (-19 inHg), ≥ 80 LPM	
Vacuum:	Tube OD Ø 8 mm	
Motor purge gas:	20 - 50 kPa, 2-5 L/min, Tube OD Ø 6 mm	
Drain connection:	1” M-NPT	

* Considering additional capability of standard unit such as USB backup, recipe cycling, PC software etc.
** Measured without substrate, limitations may apply depending on chuck used and substrate specification.
*** NPP-H with α-crystalline properties.

Options SPIN150i - SPIN200i

Foot Switch
For hands-free usage; controlling start/stop function, vacuum activation and lid functions.

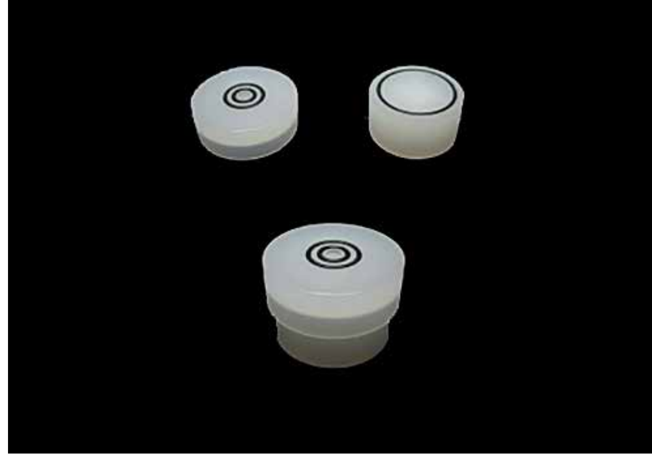


Centering Tool
Easy to use centering tool is adjustable for different substrate sizes.

Corrugated Drainhose and Connector
In NPP, including the connection to the drainport.

Vacuum Pump
The vacuum pump is quiet and reliable.

Liner Set
Liners are available in PET (Polyethylene terephthalate). 0.5 mm thick, transparent, antistatic (108 - 1010 Ω) to prevent possible build-up of static charge in the chamber.



Small fragement adapter
Additional chucks or small fragment adapters (see page 16 for full range.)

Dispense options SPIN150i - SPIN200i

Manual & Semi-Auto Dispense (Syringe Type)

Syringe Holder Starter Kit
Consists of several 30 cm^3 dispense barrels, needles and plungers.

Central Dispensing Syringe Holder
For single or triple syringes, with integrated N_2 diffuser.

Dispense Unit
Can be mounted in the syringe holder, and connected to one of the 3 programmable dry contacts.

Features:

- Digital dispense time display
- Digital air pressure display
- Adjustable dispense time, air pressure and vacuum
- Timed, Steady or Teach operation
- Vacuum control keeps thin fluids from dripping
- Foot switch
- Electric foot pedal
- Delivered with a wide range of accessories

Dispense options SPIN150i - SPIN200i

Auto-dispense (low or high volume)

Our peristaltic dispense pump is an excellent automatic dispensing addition to our spin coater series. It is a “Plug & Play” unit which is supplied ready to connect to the SPIN Series spin coaters and automate your resist or chemical dispense.

It has a number of advanced features in one compact unit. The peristaltic pump acts as both a “non-return valve”, preventing back flow, and as a fail-safe cut-off valve. The pump can be programmed to end with a post-dispense withdrawal (or “suck-back”) to avoid the risk of any droplets falling onto the substrate.

Fully programmable to dispense a steady flow rate or a pre-set volume, the pump ranges from small volume resist dispense, right up to a continuous flow for develop and etch processes. The peristaltic pump does away with the need for specialized pressure dispense vessels and additional safety valves. One-pass supply or recirculation processes are easy to configure using your existing chemical containers.

Only the tubing is exposed to the chemical, therefore different chemicals can be used with the same pump by simply changing the tubing. Changeover is easy, quick, and safe – allowing for multiple chemical options, all on the same pump. The Norprene® A-60-G tubing has excellent chemical compatibility.

Features:

- Programmable flow control
- Programmable volume dispense
- Anti-drip integrated “suck-back valve” operation
- Fail-safe integrated non-return/check valve operation
- Uses existing chemical containers
- One pump - multiple chemicals
- Coat / Develop / Etch
- Plug-&-Play

HIGH FLOW: (from 0.035 mL/min to 775 mL/min)
Designed for higher flflow rates and larger dispensing volumes such as Develop, Etch, Clean including continous flflow and recirculation applications.

LOW FLOW: (from 0.004 mL/min to 75 mL/min)
Designed for precision with lower flow rate and smaller dispensing volume applications such as photoresists.

POLOS Advanced 200 - 300 - 450

The Polos Advanced Series allows the user to either dispense manually through the syringe, or use the optional manifold with a selectable valve for dispensing one (1) chemical from the dispense vessel (DV), DI water or N_2.

- Automatic sequential or parallel chemical dispense
- Up to 6 spray nozzles
- Each programmable independently

Specifications POLOS Advanced

Specifications	POLOS 200 Advanced	POLOS 300 Advanced
Available number of programs:	Unlimited*	
Steps per program:	Unlimited*	
Spin speed:*	0 - 12,000 rpm** +/-1 rpm steps	
Spin speed accuracy:	± 0.1 rpm **	
Spin rotational direction:	Clockwise, counter clockwise, puddle	
Max. acceleration:	30,000 rpm/sec**	
Free programmable outputs:	3 dry relays, nominal switching capacity 0.5A /125 VAC - 0.3A / 60DC	
	Up to 16 digital input, 16 digital output, 4 analog input,	
	4 analog output (with optional IO modules)	
System data		
Housing material:	Natural polypropylene (NPP)***	
Process chamber material:	Natural polypropylene (NPP) or high chemical resistant PTFE (TFM™)	
Interface:	Detachable, full-size touchscreen, glove friendly, IP52, chemical resistant	
External connection:	1 USB port in the controller	
Max. substrate diameter:	260 mm round or 6" x 6" square	360 mm round or 8" x 8" square
Max. process chamber diameter:	302 mm	402 mm
Dimension (desktop version):	380 (w) x 307 (h) x 599 (d) mm	430 (w) x 310 (h) x 650 (d) mm
Shipping weight:	20 kgs	32 kgs
Shipping dimensions:	680 x 580 x 480 mm	780 (w) x 620 (h) x 580 (d) mm
Requirements		
Voltage:	100 - 120 VAC / 200 - 240 VAC 50 / 60 Hz (auto select) Peak 1800 W	
Power consumption:	10 A / 8 A	
Max. current:	- 80 kPa (-24 inHg), ≥ 80 LPM Tube OD Ø 8 mm	
Vacuum:	20 - 50 kPa, 2-5 L/min,	
Motor purge gas:	Tube OD Ø 6 mm	
Drain connection:	1” M-NPT	

* Considering additional capability of standard unit such as USB backup, recipe cycling, PC software etc.
** Measured without substrate, limitations may apply depending on chuck used and substrate specification.
*** NPP-H with α-crystalline properties.

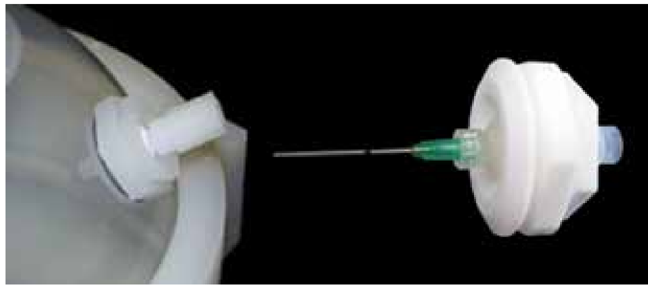
Specifications POLOS Advanced

Specifications	POLOS 450 Advanced
Available number of programs:	Unlimited*
Steps per program:	Unlimited*
Spin speed RPM:	0 - 1,500 rpm ** ± 1 rpm steps
Spin speed accuracy:	± 0.1 rpm **
Spin rotational direction:	Clockwise, counter clockwise, puddle
Max. acceleration:	≤1,500 rpm/s depending on the load **
Free programmable outputs:	3 dry relays, nominal switching capacity 0.5A /125 VAC - 0.3A / 60DC
	Up to 16 digital input, 16 digital output, 4 analog input,
	4 analog output (with optional IO modules)
System data	
Housing material:	Natural polypropylene (NPP)
Process chamber material:	Natural polypropylene (NPP) or high chemical resistant PTFE (TFM™)
Interface:	Detachable, full-size touchscreen, glove friendly, IP52, chemical resistant
External connection:	1 USB port in the controller
Max. substrate diameter:	460 round and 350 x 350 mm square substrates
Max. process chamber diameter:	502 mm
Dimension (desktop version):	795 (w) x 638 (h) x 922 (d) mm
Shipping weight:	75 kgs
Shipping dimensions:	800 (w) x 790 (h) x 1180 (d) mm
Requirements	
Voltage:	200 - 240 VAC 50/60 Hz
Power consumption:	Peak 1000W
Max. current:	10 A
Vacuum:	-80 kPa (-24 inHg), ≥ 80 LPM. Tube OD Ø 8 mm
Motor purge gas:	20 - 50 kPa. Tube OD Ø 6 mm 500 LPH
Drain connection:	1.5” M-NPT

* Considering additional capability of standard unit such as USB backup, recipe cycling, PC software etc.

** Measured without substrate, limitations may apply depending on chuck used and substrate specification.

Options POLOS Advanced



EBR (Edge Bead Removal)
0.15 mm jet spray for accurate pointing of chemical dispense.

Auto Dispense Lines
Full PTFE dispense vessel automated injector line.

MegPie
The sapphire MegPie is a single-wafer megasonic transducer used for cleaning and sonochemical processing.

BSR (Back Side Rinse)
With adjustable position and spray angle.

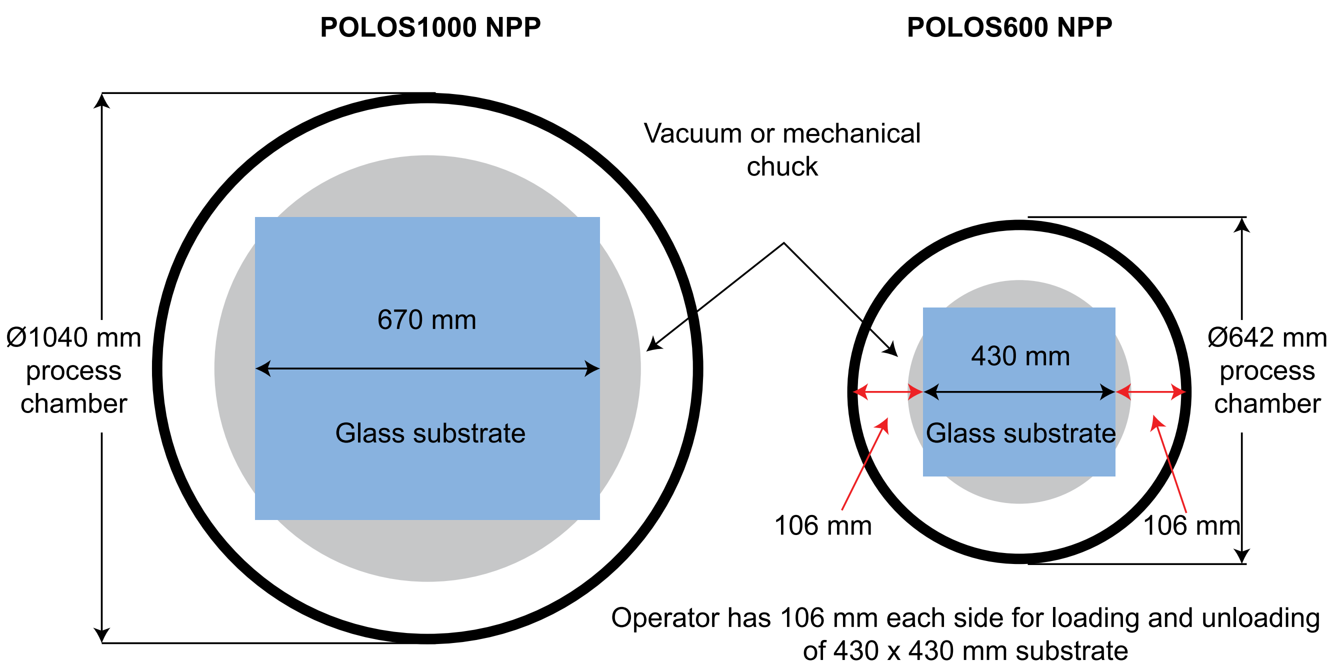
Static Barrier Plate
With adjustable distance settings from the substrate for better coating uniformity.

Jet Spray injector
For accurate dispensing of chemicals, with adjustable dispensing position.

Corrugated Drainhose, Drain Tank and Connector
In the NPP, including the connection to the drainport.

Vacuum Pump
The vacuum pump is quiet and reliable.

POLOS 600 - 1000



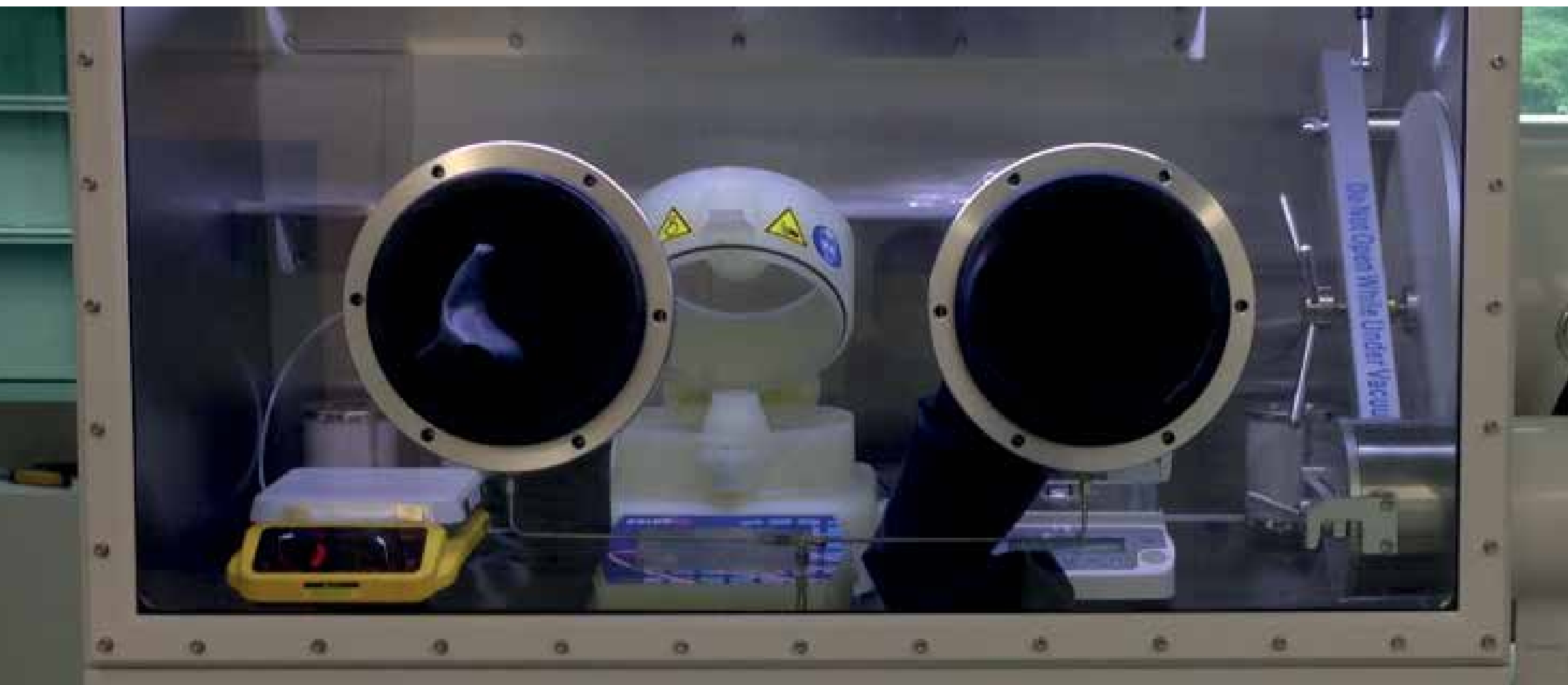
Glove box

Do you want to use a spin coater in a glove box?

A glove box provides a versatile working space isolated from the outside (room) atmosphere, designed to shield operators from danger, and enable repeatable spin coating in a high purity inert atmosphere.

The SPIN150i spin processor has been specifically designed for R&D purposes and is ideal for processing small fragments and wafers up to 150 mm in a clean, particle-free environment. The chamber can be supplied in either natural polypropylene (NPP) or PTFE for greater chemical compatibility. The versatile platform with 3 programmable I/O ports is ideal for applications including photoresist spin coating, etch, develop or cleaning processes, or, when used in a glove box with proper filtered exhaust, processes with aggressive chemicals.

Colour Touchscreen



Glovebox

The detachable keyboard, connected using a standard CAT5 ethernet cable, allows the SPIN150i to be easily installed within the glovebox. The small footprint and height of only 250 mm (9.84") allows the unit to fit through a standard air-lock.

Foot Switch for hand free usage; controlling start/stop function, vacuum activation and lid functions.

The keyboard can be installed, either inside or outside the glove box. The large icons on the touchscreen panel and chemical resistant keyboard are glove-friendly. Alternatively the unit can be operated by optional foot switch.

For OEM-installations we also offer in-deck spin coaters, which are designed for full integration* into the glove box.

** Full integration should only be undertaken by an OEM glove box manufacturer.*

Jacomex glove box with a spincoater integration

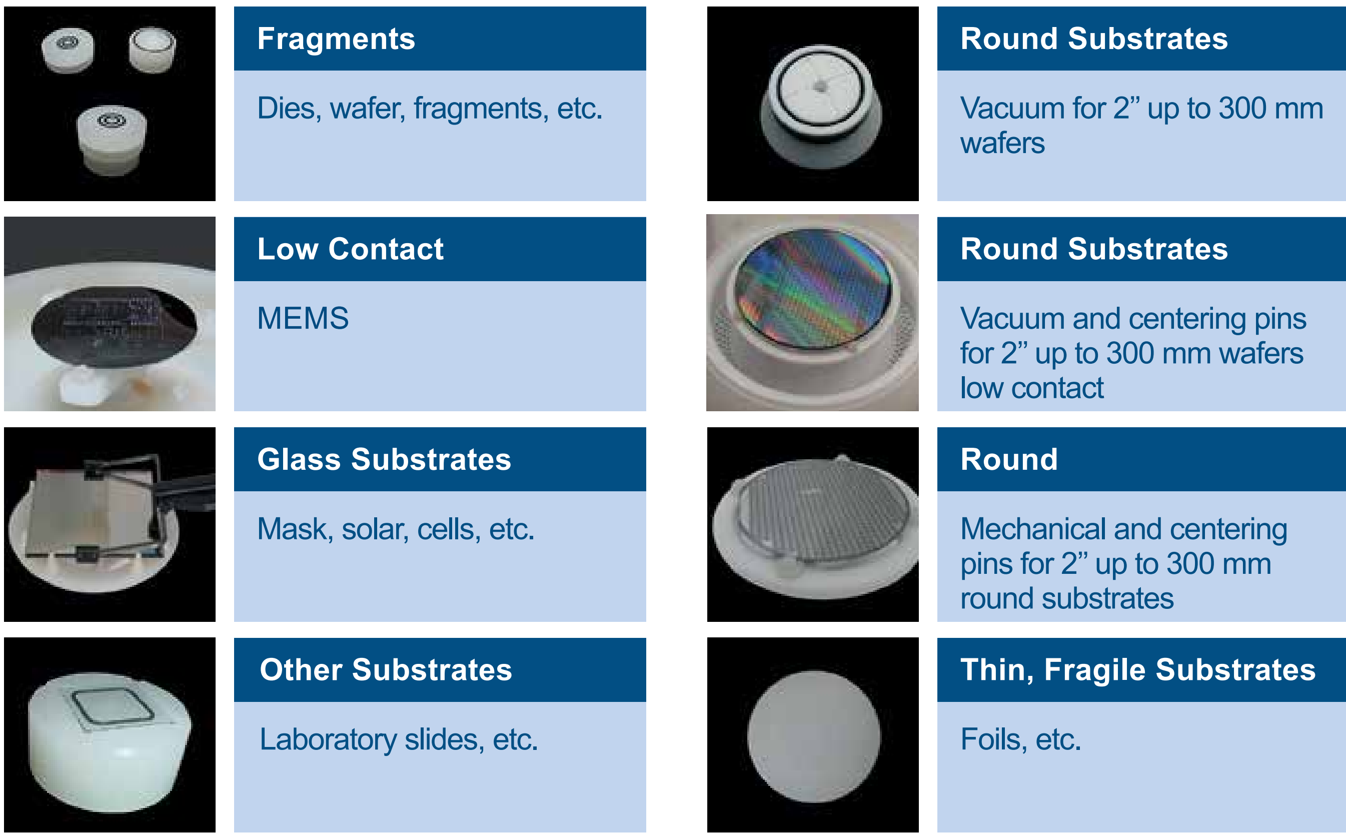
Vigor glove box with a SPIN150i table top

Vacuum or Mechanical Chucks

We offer several chucks for use in our spin coaters. One vacuum chuck is always included standard with the system. We stock a range of precision machined polypropylene or PTFE (solvent safe) chucks compatible with our spin coaters up to 300 mm. POLOS chucks are machined to close tolerances, and provide an exceptionally flat, rigid surface for mounting substrates of different sizes, weights, and shapes.

Smaller sizes include an interchangeable small fragment adapter with a push fit base that fits firmly onto the standard included chuck for ease of use. SPS-Europe can also provide custom chucks depending on your application, including porous PTFE for thin substrates. For square and rectangular substrates, we offer a recessed design which holds the substrate securely in place both with and without vacuum, reducing substrate warpage for better film uniformity during coating.

Chucks are available in the following materials*:
PP: NPP with EPDM o-ring, FP: PTFE (TFM™1600with FKM o-ring), SS: Stainless steel, AL: Aluminum



***Note: Other materials available upon request. Please contact us for details.**

Typical Applications

Our extensive line of spin processors covers a wide range of process applications. Used in combination with our megasonic MegPie and special Lift-Off fluid, these spin processors can further be used for photoresist stripping and metal lift-off. Our POLOS Advanced Series can be used with ozone in DI water (DiO_3), providing an effective replacement for Piranha (H_2SO_4 H_2O_2) cleans.

Suitable for all typical spin processes, the systems are available in all-PTFE construction for special applications.

Cleaning - Etching - Coating - Developing

The following pages provide examples of typical applications that effectively demonstrate our processors capabilities.

Coating

Spin coating is one of the most common techniques used in the fabrication of nanometric polymer thin films (PDMS, block copolymers, etc.). The acceleration within the programmable spin speed is important, as it controls the thicknesses that can be achieved from a given solution. Spin coating can produce uniform films from upwards of 1,000 rpm with relative ease.

The advantage of the POLOS range spin coaters, with its high speed of 12,000 rpm and ramp-up of up to 30,000 rpm/sec*, is its ability to quickly produce uniform films from a few nanometers, to several microns thick.

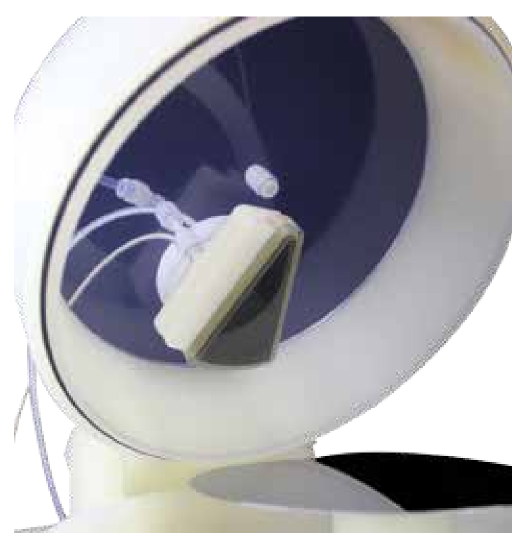
Control of the motor mode rotation (clockwise/ counterclockwise), combined with up to 6 automatic dispensers, enables a uniform deposition of multilayer thin films and photoresist development. These features support a quick process optimization with fully automatic and highly reproducible recipes.

Connect N_2 top purge to fill the chamber with N_2 blanket

The physical and chemical cleanliness of a substrate is critical for high quality films, regardless of the application method. Our units can integrate with the megasonic line, providing the user with one encompassing system that enables a wide range of processes.

*Depending on substrate size and chuck type.

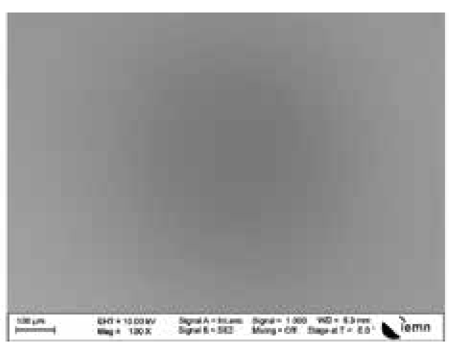
Example: Post-CMP Cleaning



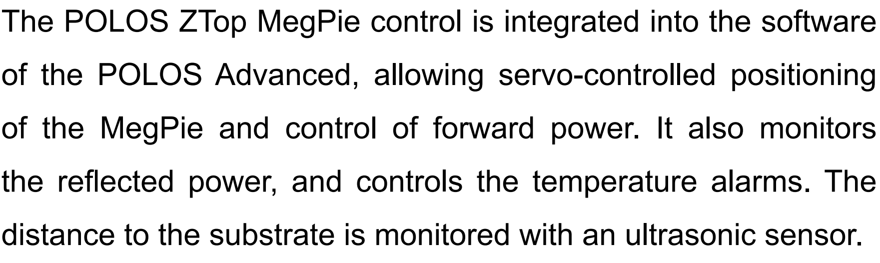
After CMP, the surface can be highly contaminated by slurry residues. Tests performed on a 3” silicon wafer polished with a slurry containing 50 nm colloidal silica particles demonstrated that the use of POLOS Advanced with ZTop MegPie megasonic transducer operating at around 1 MHz and combined with diluted NH_4OH, produced excellent cleaning results. *

Highly diluted (2%) NH_4OH is used to enhance electrostatic repulsion between particles and surface (control of Zeta potential) to avoid re-deposition and re-attachment.

After CMP **After megasonic cleaning**



Our test case integrated the Polos ZTop MegPie within the POLOS Advanced 200 mm spin processor. This MegPie kit allows you to choose between 150 and 200 mm active area, and is available with a sapphire or stainless steel ZTop MegPie.



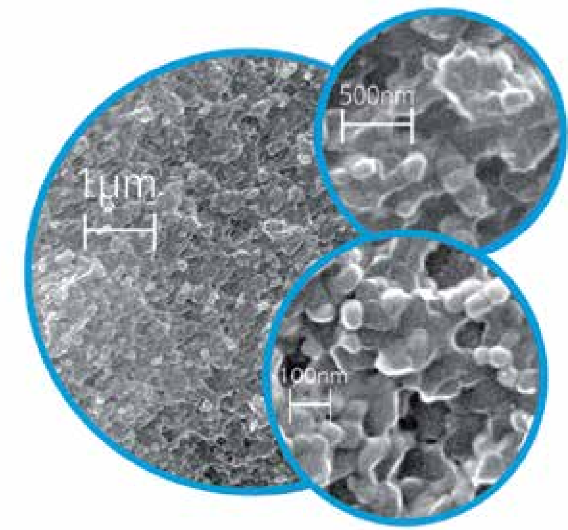
The POLOS ZTop MegPie control is integrated into the software of the POLOS Advanced, allowing servo-controlled positioning of the MegPie and control of forward power. It also monitors the reflected power, and controls the temperature alarms. The distance to the substrate is monitored with an ultrasonic sensor.

Excellent results are achieved by using the megasonic cleaner diluted with NH_4OH.

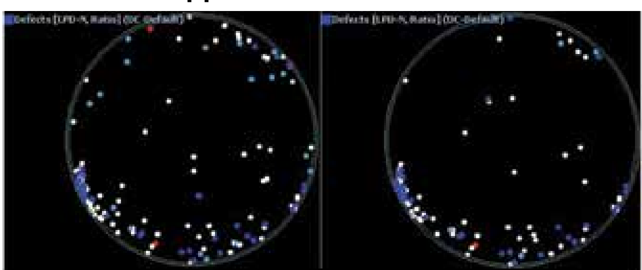
* Test report available upon request.

Example: Non-Hazardous Cleaning, Photoresist Stripping and Metal Lift-Off

SPS-Europe offers water-based fluids that use a unique non-disruptive technology. Based on smart, gentle chemicals, these novel fluids enable new possibilities for innovative stripping and lift-off applications in microelectronics. The eSPRO Resist strip product line is made of liquid-liquid solutions forming dynamic internal structures. The phase-shifting plasmicells change their forms 1,000 to 8,000 times per seconds.

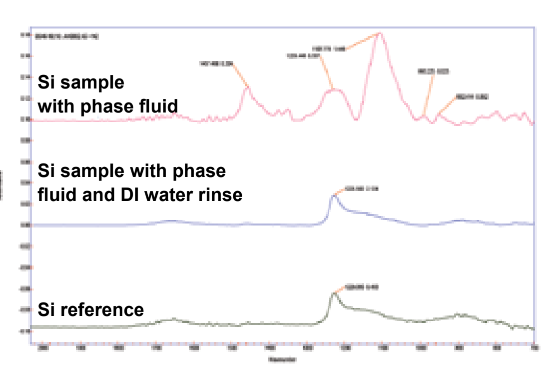


Particle free application



Pre processing	Post processing
74 defects	112 defects (38 adder)
0.12-1.00 µm	0.12-1.00 µm

Residue free removal



FTIR characterization of the Si reference and sample after a fluid and water rinse-off shows a total surface recovery, and absence of any residues.

Particle measurements (KLA Tencor SP2) indicate almost neutral particle behavior after cleaning with a phase fluid followed by a diluted SC1 short rinse. Use of the MegPie can reduce the process time or enhance performance. The neutral pH and the new working principle, leave the surface properties of the substrates unaffected. The final rinse leaves the wafer surface unaffected and free from residues.

Physical data overview

Parameter	eSPRO fluid
pH	5 - 7 (undiluted)
Flash point (DIN EN 22719)	>60 °C n. definable
Flow time (DIN 53211)	~ 54 sec. (22 °C)
Boiling point	90 - 98 °C
Freezing point	-5-4 °C
Gravity (22 °C)	0,996 g/cm3
Viscosity (20 °C)	t.b.d.

The fluids are compatible with all silicon, silicon dioxide, silicon nitride, titanium, metals and metal oxides and many other substrates. The working principle of the fluids is a pure physical lifting off instead of a chemical dissolving.

Fluids enable:

Technical advantages on substrates

- These fluids reduce the impact of the stripping process, such as surface roughness, pattern collapse, and insufficient wetability and reduce the complexity of your processes.

TCO & performance advantages

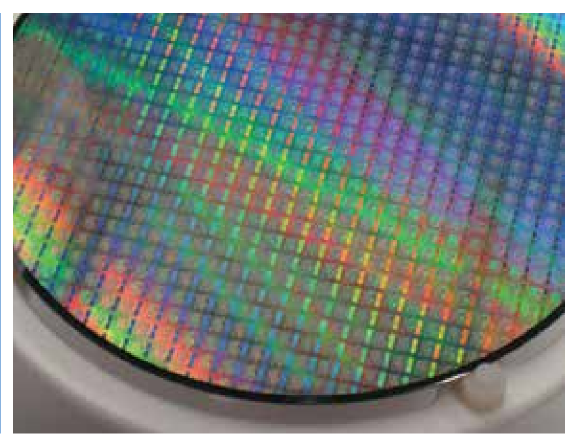
- The novel mode of action optimizes process parameters such as time, temperature, energy, consumption and/or bath life.

Ecological advantages for safe use

- Fluids consist only of gentle non-hazardous chemicals. The water-based solutions are non-flammable, pH neutral, biodegradable, and can be easily deactivated by adding water.

Advantages of eSPRO resist strip

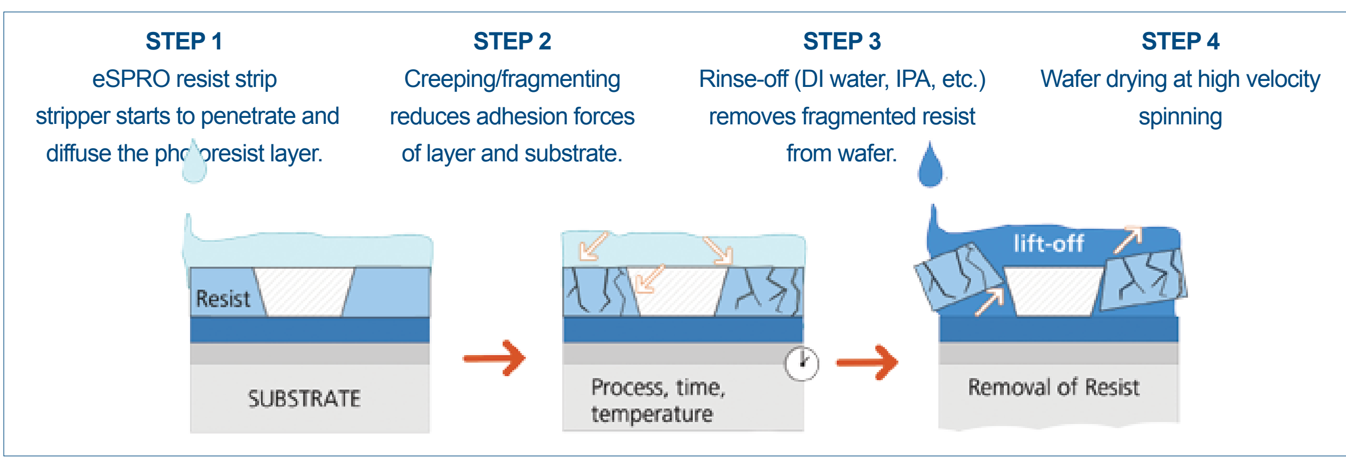
- Enables future semiconductor technology trends
- Reduced total cost of ownership
- Reduction of process steps and time
- Extraordinary stripping performance
- Sustainable process fluids (incl. recycling)
- Dermatologically tested (safe and non-toxic)
- Neutral pH range, non-corrosive, non-etching
- No substrate stress, corrosion or oxidation
- Smart and powerful formulations

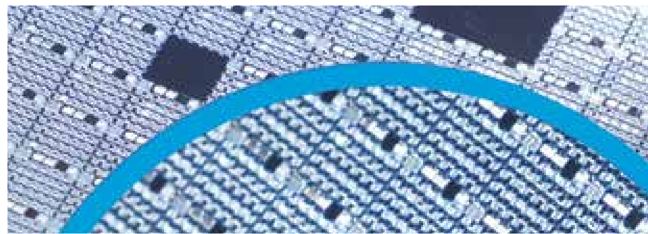


Process data for eSPRO resist strip waterbased photoresist stripper

Batch bath process (example)	Single wafer process (example)
Adjust required bath temperature (20 to 50 °C) Immerse wafer lot into bath Leave wafers in bath for requested time Use ultrasonic/agitation for faster process Bring wafers into rinse cascade Rinse with DI water, IPA or intelligent rinse® Dry wafers with nitrogen or compressed flow	(pre treatment in soak bath if requested) Wet transfer on single wafer chuck Spray lisoPUR®: 90 psi, 250 rpm, 50 °C, 60 sec. DI water spray: 90 psi, 250 rpm, 50 °C, 30 sec. IPA rinse: no pressure, 250 rpm, RTemp., 30 sec. Dry spin: no pressure, 2000 rpm, RTemp., 60 sec. All steps under nitrogen atmosphere (optional)

Stripping times vary from few seconds to few minutes, depending on resits thickness and crosslinking. Agitation or ultrasonic can reduce the process time or support the performance. Due to the pH neutral fluid and the new working principle the surface properties of the substrates stays uneffected. Final rinse leaves wafer surface uneffected and free from residues.





Example: Megasonic Enhanced Photoresist Strip with DiO_3

Dissolved ozone in DI water (DIO_3) provides an effective replacement for Piranha (H_2SO_4 H_2O_2) cleans. The fundamental chemistry of ozone-based cleaning is a result of direct and indirect reactions to ozone and oxygen radicals (radical pathway). Due to its high oxidation rate, the radical pathway can accelerate the reaction. Megasonic energy promotes the radical pathway. Simultaneously, the creation of turbulence inside the boundary layer increases the available ozone near the surface.

A study by D. Dussault of ProSys, and Jens Fittkau and Christiane Gottschalk of ASTeX GmbH, shows that the combination of DIO_3 and a uniform Megasonic energy field in a conventional single wafer spinner significantly increases the strip-rate of various positive photoresist coatings, compared with DIO_3 alone.

Figure 5. Comparison of spin speeds, AZMIR701 PR, 80 ppm, 20 c, 1.4 lpm.

They measured improvements in strip-rate of over 65% (figure 5). Variations in spin speed (rpm), flow rate (L/min), and megasonic dosage (W/cm^2) resulted in significant effects on the measured strip-rate.

The POLOS Advanced 200 Series allows for ± 0.1 rpm** spin speed accuracy. The user can easily program a speed of up to 12,000 rpm in 1 rpm step increments. Up to 6 dispense lines can be controlled automatically.

** Measured without substrate. Limitations may apply depending on the chuck used, and the substrate specifications.

Source: References [1] US Patent 6,791,242 (2004)
Don Dussault , ProSys Inc, Jens Fittkau2 and Christiane Gottschalk, ASTeX GmbH

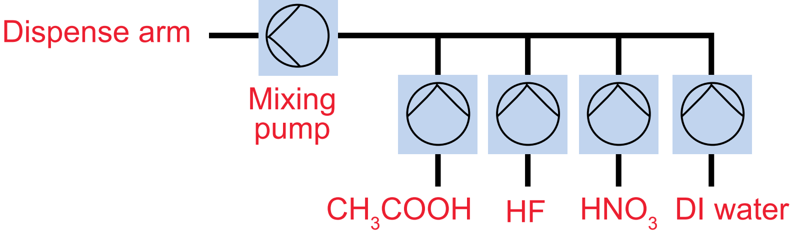
Example: Etching

Spin etching as post-treatment after wafer thinning

Wafer thinning (back side grinding) is used in IC and MEMS fabrication in order to:

- Achieve a desired device thickness (ICs, MEMS)
- Ensure a specific thickness based on device functionality (MEMS)
- Reduce substrate series resistance in vertical devices (power devices)

A study by Dr. K. Gottfried of Fraunhofer ENAS on spin etching with HNO_3/HF/CH_3COOH on a POLOS Advanced Spin Station proved that wet etch, executed as spin etch, offered a removal of 10 µm silicon. Furthermore, it almost completely removed all traces of grinding induced substrate damage.



The platform offers a comparatively simple and reasonably priced process setup. Much faster than CMP, the process offers a high and tunable etch rate, and the ability to process backside ground wafers directly, without additional cleaning.

Standard features

- Process applicable to 100 mm, 150 mm and 200 mm wafers with minimum conversion time (less than 15 minutes)
- Chemicals
- KOH
- HNO_3/HF/CH_3COOH (HNA)
- Continuous wafer rotation
- Puddle mode
- Dispense position and mode:
  - Fix position
  - Oscillating movement over a specific distance (wafer diameter)
- Spray dispense
- Flush dispense

Depending on the chemicals used

Source: Fraunhofer ENAS-Dr. Knut Gottfried, Precise Bulk Silicon Wet Etching 2013

Spin Process Station

Based on the proven high quality POLOS single substrate spin processor, the modular design spin process station is an excellent value: full plastic construction, high-end components, compatibility with any chemical environment in a modular set-up, and suitable for all your specific requirements. The spin process station is an extremely versatile platform for a wide range of processes.

Multi-Process Chamber

The compact circular process chamber is constructed of solid polypropylene or ultra pure PTFE, while the movable dispense arm, process tanks, and chemical supply lines are all made of ultra-pure, seamless Teflon® (PFA or PTFE). This entirely metal free environment is suitable for a variety of aggressive chemicals, and a multitude of processes. The sideway integrated dispense arm fully withdraws from the process chamber to avoid negative influence on process uniformity.

Modular setup for a wide process window in a compact footprint

General features:

- Single substrate
- Spin processor
- Wide process window
- Manual loading
- Flexible processing
- Accurate & repeatable
- Compact footprint

Value proposition

- Fully automatic, accurate and repeatable processing:
- Movable linear dispense arm:
  - Freely programmable static, dynamic or oscillating chemical dispense
  - High pressure and/or megasonic cleaning directed to any point on the substrate.
- Static chemical dispense through a range of adjustable nozzles in the domed lid.
- Adjustable back side spray arm
- Heavy duty motor: programmable for 0 - 12,000 rpm.
- CW & CCW Rotation allowing puddle mode.
- Freely programmable processes:
  - Sequentially programmable multiple dispense line
  - Stepless programming of various flows within a process step from 150 up to 2,500 mL/min.
- For optional integrated mixing systems, the mixing rates of the various chemicals can be programmed for each step.

Spin Process Station

Examples for a wide range of substrates and applications:

- **Laboratory glass slides, e.g. 76x26 mm**
- **Pieces & fragments**
- **Wafers: from 1” up to 12”**

Application examples

- SC1-SC2-DHF clean-rinse
- HF/HNO_3 etch
- Photo resist coating
- Edge bead removal (EBR)
- Puddle and/or spray developing
- Post CMP high pressure and/or megasonic cleaning
- 70 °C KOH etch with recirculation
- Diced wafer clean (on film frame)

- **Mask/FPD glass substrates:**

Application examples:

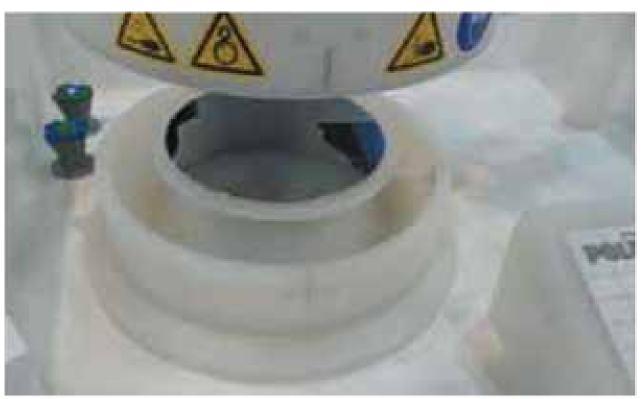
- Coat-develop, up to 20”
- Piranha (Etch)
- Cleans up to 16”

- **Solar cells: 103, 125, 156 and 210 mm square**

Application examples:

- Texturing: alkaline or acidic
- Porous Si etch
- Oxide etch (PSG removal)
- Cleaning
- Protective layer coating

- **Film frames: 4” up to 12”**
- **Optical media**



Spin process stations are available in 85 cm, 1.40 m, 1.70 m and 2 m wide welded polypropylene enclosures, with built-in integrated spin processors that contain separate pneumatic, electrical and chemical compartments. Chemical tanks, heaters/chillers, etc. are safely stored and easily accessible in a slide-out drawer. The heart of each spin process station is the POLOS spin processor proven technology. These rugged, reliable units deliver long lasting repeatable performance.

Spin process stations offer a wide process window for your current and future requirements, and they are surprisingly affordable.

Spin Process Station

Safety

To protect users, the process chamber opens automatically, and the chuck is raised to present the substrate for easier and safer unloading. This eliminates all possible contacts between the operator and chemically contaminated surfaces. Both manual and automatic chamber rinse/flush sequences can be programmed, allowing all contaminated surfaces to be neutralized easily, even after a power failure. The automatic chemical supply system and the drain/extract / exhaust are integrated into the system to ensure a fail-safe operation. Purged labyrinth seals, monitored safety interlocks, alarm sensors, vacuum monitoring, spin motor overload protection, and an emergency switch ensure the highest standards of safety.

Main options:

- In-situ Z-axis chuck movement
- Linear dispense arm, servo controlled
- Multiple dispense lines & nozzles
- Several chuck designs available
- Highly responsive closed loop flow control system
- In-situ chemical mixing
- Heated chemical supply
- Megasonic cleaning
- High-pressure jet
- Teflon® process tanks or dispense vessels
- Chemical reclaim, filtered chemical recirculation
- Multiple drain outputs

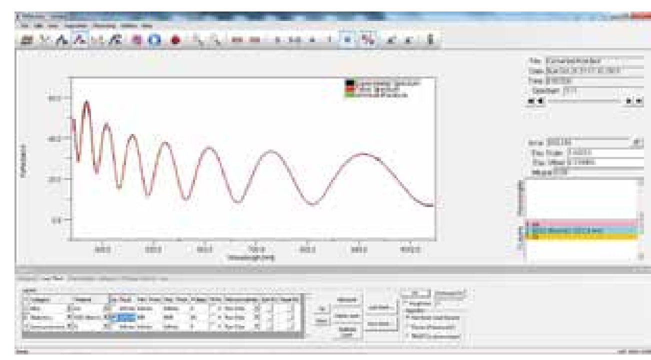
Thin Film Measurement

Portable thin film measurement system

FR-pOrtable is a unique turn-key solution for accurate & precise optical characterization of transparent and semi-transparent single films or stacks of films. With FR-pOrtable, the user can perform reflectance measurements for films in the 360-1,050 nm spectral range. In a single click, it can characterize thin & thick, transparent & semi-transparent films by analyzing light reflection with a thickness measurement range of 15 nm to 90 µm.

Get rid of power cables and large lab space requirements. Thanks to its unique design, FR-pOrtable draws power from the USB cable that connects it to your computer.

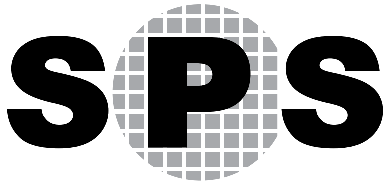
Easy, portable, with USB-Connection to your laptop



POLOS precision bake plate

This new table top hotplate is a versatile and affordable tool for R&D and pilot lines. The POLOS hotplate is available for processing single or double substrates. A precision digital temperature controller enables adjustable temperature steps from 1 °C to 230 °C. It is suitable for soft bake as well as hard bake processes, and curing of photo resist, epoxy, or any other application requiring precise temperature control.

Standard models for substrate sizes 150 mm, 200 mm and 500 mm.



With >2,000 systems installed worldwide, up and running for over many years, our Polos Spin Coater have proven themselves as the #1 single wafer spin processor. For over 25 years now, SPS-Europe offers versatile, high-quality, all plastic POLOS™ single substrate spin processors. Various models have proven themselves over the years for processing a wide range of substrates from small fragments up to Ø450mm substrates. We offer even units for flat panels up to 1000mm square. SPS-Europe operates as a full-service distributor to the front-end semiconductor manufacturers and related industry. From our 6 offices in Europe, 1 office in Singapore, and a world-wide distributor network, we offer full-time service engineer support for the systems we supply in almost every country. Dedication towards our customers and flexibility in finding the right solution, combined with solid application knowledge and fast supply logistics, are the keywords of our service.

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