Pioneering ALD experience since 1974

Picosun
The ALD Powerhouse

Picosun SUNALE™

P-series ALD systems

Bridging the gap between research and production

THE FUTURE OF THIN FILM IS HERE

Experience the full potential of ALD with Picosun's new SUNALE™ reactors. Imagination is the limit – with our compact, versatile and uniquely scalable ALD system design the gap between research and production is no more.

SEMI organization President and CEO Stanley T. Myers presents the European SEMI 2004 award to Dr. Tuomo Suntola at Semicon Europa 2004 exhibition in Munich.

Picosun Board of Directors. Back row, from left to right: Prof. Lauri Niinistö, Mr. Kustaa Poutiainen (CEO), Prof. Jorma Routti, and Mr. Juhana Kostamo (Managing Director). Front row, from left to right: Dr. Tuomo Suntola and Mr. Sven Lindfors (CTO).

Picosun – Defining the future of ALD

"There is not a single ALD company in the world with credentials matching those of Picosun"

Picosun's history and background date back to the very beginning of the field of atomic layer deposition. ALD was invented in Finland in 1974 by Dr. Tuomo Suntola, who today serves as Member of the Picosun Board of Directors. Picosun founder and Chief Technology Officer (CTO) Mr. Sven Lindfors has created outstanding ALD systems since 1975 and is known as the "world's most experienced ALD reactor designer".

30 years exclusively on ALD

Today Picosun combines over 30 years of continuous, exclusive ALD system development with over 200 person years of first hand know-how in the field. The company was established in 2003 and our core team consists of highly trained academic personnel, all experts in ALD. Picosun team, described by many as "the best ALD team ever", has contributed to over 100 patents on ALD and our close collaboration with top research organizations and major industries solidifies our frontline position in the global ALD network.

Unique scalability from research to production

Picosun is an international equipment manufacturer with a world-wide sales and service organization. We develop and manufacture ALD reactors for all kinds of micro- and nanotechnology applications. Picosun provides its customers with user-friendly, reliable and productive ALD process tools with top level after-sales, demo coating and process consulting services. The company is based in Espoo, Finland and has its US headquarters in Detroit. SUNALE™ ALD systems are used by leading scientific institutions and companies across four continents.

We get it right

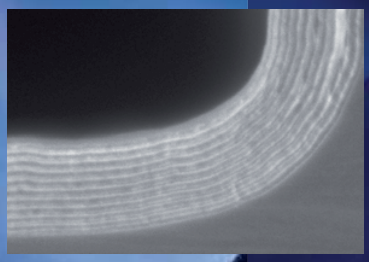
What makes us special in the field is our exclusive focus on ALD. We get it right, where many just struggle. We understand the customer's needs and can offer unmatched quality coating solutions that fulfill even the most stringent research and productivity requirements. With our uniquely compact, upscalable and versatile reactor design, there is no hindrance to the transition from research to industrial production.

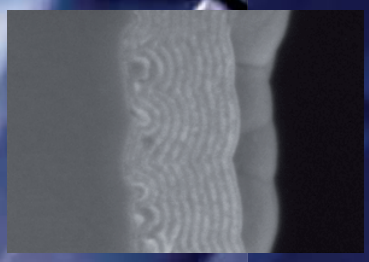
ALD – Winner technology for thin films

As a surface controlled, self-limiting chemical vapor processing method, ALD ensures 100 % uniform, conformal, defect and pinhole free thin film growth on even the most challenging nanoscale architectures such as ultra-high aspect ratio trenches and high tortuosity through-porous samples. Wide range of e.g. metal oxide, nitride, sulfide, fluoride and pure metal coatings as well as nanolaminates, mixed oxide and doped thin films can be used in numerous applications for example in micro- and optoelectronics, optics, catalyst manufacturing, clean and renewable energy technologies, water purification and innovative packaging materials.

Examples of ALD Applications

Material	**Applications**
Aluminum oxide, Al_2O_3	MEMS coatings, passivation coatings, insulator layers, diffusion barriers, etch stop layers
Tin dioxide, SnO_2	Optoelectronics, gas sensors, antistatic coatings, ARC
Titanium dioxide, TiO_2	Photocatalytic coatings, photovoltaics, antistatic coatings
Vanadium oxides, V_2O_5 and VO_2	Catalyst coatings, optical switching materials, energy storage
Zinc oxide, ZnO	Semiconductor materials, buffer layers in solar cells, UV blocking layers
Titanium nitride, TiN Tantalum nitride, Ta_3N_5	Metal electrodes, diffusion barriers
Hafnium dioxide, HfO_2 Zirconium dioxide, ZrO_2	High-k dielectrics
Iridium, Ir Platinum, Pt Ruthenium, Ru	Metal electrodes





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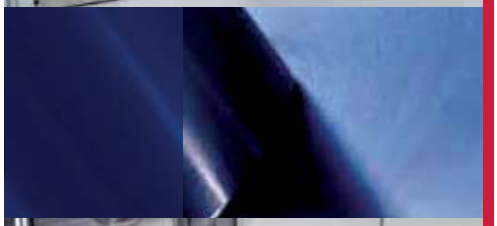
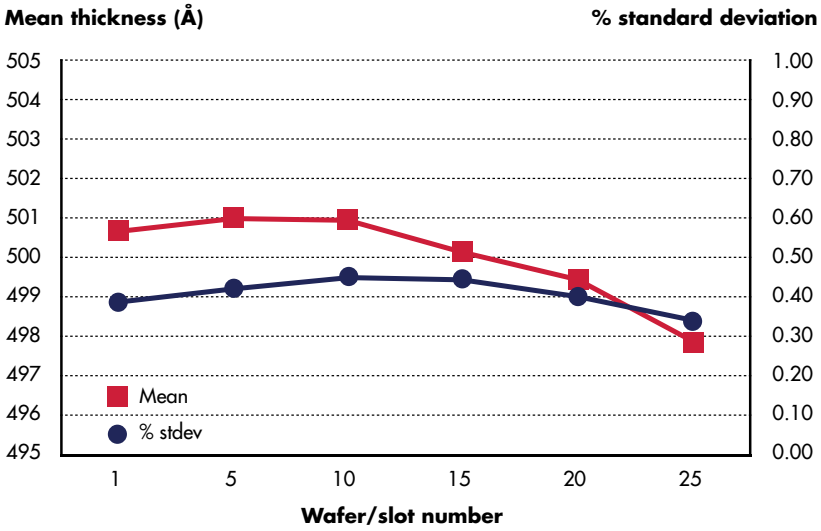


SUNALE™ P-SERIES ALD process tools

Fully automatic single wafer and batch processes for high-volume manufacturing

With Picosun's SUNALE™ P-series, the results achieved and demonstrated with R-series can be transferred straight to high volume industrial production. Fast, safe, reliable, fully automated production line and/or vacuum cluster compatible system ensures maximum, cost-efficient throughput under all conditions. Our unmatched level of knowhow on ALD process mechanics ensures that production progresses smoothly with even the most challenging precursor chemistries and substrate architectures, consistently offering excellent particle level, uniformity and repeatability results.

Our compact, highly functional reactor design saves expensive facility space whereas quick and easy maintenance results in minimal system downtime. Picosun's top quality support organization is always ready to offer on- or off-site consulting from process chemistry to maintenance and customization of the SUNALE™ reactors. Prior to purchase, our demo service ensures the reactor is optimized for 100 % fulfillment of your most demanding production requirements.



Examples of film thickness repeatability. TMA + H_2O process, NUw2w = 0.243 %. 49 pts measurement on 6'' Si wafers, 25 wafer batch. Picosun customer data.

200 MM WAFER BATCH RESULTS		100 °C	200 °C	275 °C
1sigma non-uniformity	W-I-W	1.36%	1.14%	0.86%
1sigma repeatability	W-T-W	1.90%	1.02%	0.68%

Film uniformity and repeatability results. 100 nm Al_2O_3 deposition on a 25 pcs Si wafer batch. Picosun customer data.

SUNALE™ P-SERIES technical features

Basic features

Substrate size and type	Up to 300 mm single wafers Up to 300 mm wafer batches 156 mm x 156 mm solar Si wafers 3D objects Powders and particles
Process temperature	50 – 500 °C
Substrate loading options	Pneumatic loader, robotic loader
Precursors	Liquid, solid, gas, ozone Level sensors, cleaning and refill service Up to 12 sources with 4 separate inlets

Measures

Weight	700 kg
Dimensions (W x H x D)	149 cm x 191 cm x 111 cm

Utilities

Power supply	400 VAC, 3 phase, 50/60 Hz, Fuse 3 x 16 Amps. Power depending on options.
Vacuum pump	Recommendation min. 420 m^3/h, mechanical particle trap
Carrier gas	99.999 % N_2 / Ar, min 2 slm
Compressed dry air	5 – 6 bar overpressure
Cooling water	Only required for the dry vacuum pump and ozone generator, not for the reactor
Exhausts	Vacuum pump, source cabinets

Options

Cassette loading module, gas scrubber, factory host software connectivity

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