PICOSUN™ Research ALD Product Line

Versatile and Modular ALD Tools for Research and Development

Picosun

Picosun ALD – Enabling The Future

ALD is the manufacturing method of choice for future-oriented industries.

Atomic Layer Deposition (ALD) is the most advanced thin film coating and surface processing technology of today. ALD creates ultra-thin films of various materials - oxides, nitrides, sulphides, carbides, fluorides, metals, even polymers - on practically all kinds of surfaces with digitally precise and repeatable control over film thickness, uniformity, composition, and conformality. ALD films are pinhole-, crack-, and defect-free by nature. The ALD process takes place in vacuum at relatively low temperatures, allowing its application also to sensitive surfaces.

ALD has a central, well-established role in modern semiconductor industries. Functional material layers manufactured with ALD enable constantly miniaturizing integrated circuit (IC) components for faster and more reliable computing, mobile communications, and data transfer and storage.

ALD is present in the most advanced products of today.

"Smart" homes and industries, safer cars and other transportation, quicker and easier medical diagnostics, and wearable health monitoring devices are realized with microscale sensors. ALD is a key technology in cost-efficient manufacturing of these devices. Energy-saving LED lighting is made brighter and longer-lasting by ALD, and precision optical layers for various special applications are created with ALD. In medical technology, patient safety and lifetime of surgical implants are improved by biocompatible ALD coatings. Novel, targeted drug delivery methods are also being developed utilizing powder materials functionalized with ALD.

ALD enables sustainable future.

For sustainable future, ALD films enhance the performance of solar panels and fuel cells. Novel, high energy density batteries and energy harvesting devices utilize ultra-thin ALD layers. Powder carriers activated with ALD coatings show potential for low-cost and environmentally friendly catalysts. Value items such as noble metal jewelry and collector coins can be protected against aging effects, darkening and discoloration by ALD. In watchmaking and jewelry industries, shiny and colorful ALD films with vibrant, metallic hues enable totally new visual look - in non-toxic, non-allergenic, and material-saving way.

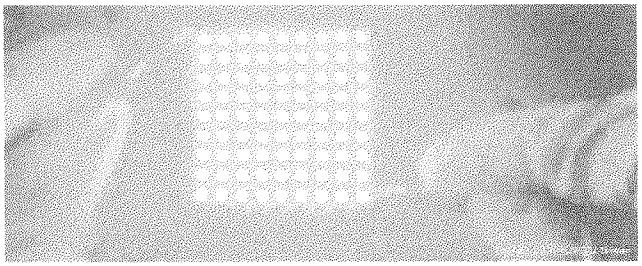
Picosun provides production-proven ALD solutions.

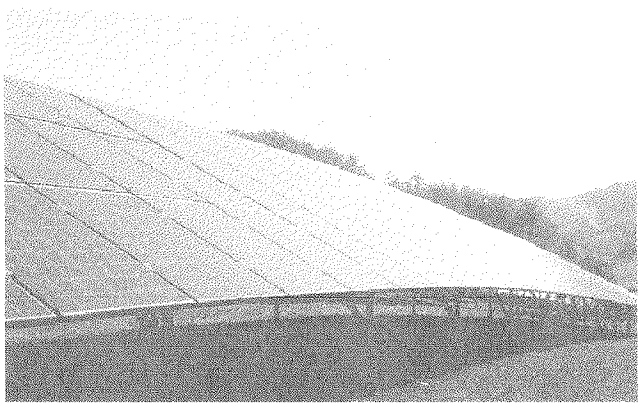
Today, many of the world's largest microelectronics and IC manufacturers have chosen Picosun's ALD solutions to realize their most advanced products. Outside of the IC realm, our industrial ALD technology has been selected for production use by various, global minting, watchmaking, medical implant, energy, and solid state lighting industries.

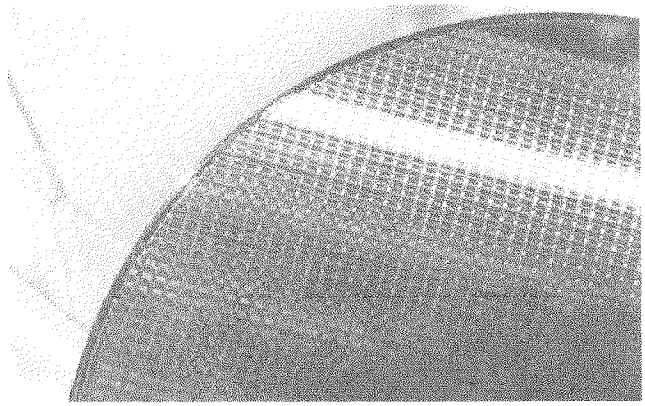
We provide our customers turn-key ALD production solutions with the most extensive all-around sales support. PICOSUN™ ALD equipment represent the leading design and manufacturing quality. Every component and feature is carefully selected, tested, and optimized for unfaltering performance day in, day out. Our ALD process quality and purity are world-leading. Combined with the highest productivity and reliability, easy operation, and low cost-of-ownership, PICOSUN™ ALD systems are the choice of all forward-going industries.

Picosun's ALD technology creates unparalleled competitive edge to your products - with atomic layer precision!

We at Picosun stand apart from all other equipment manufacturers due to our unique, groundbreaking expertise in the field - reaching back to the invention of the ALD technology itself. Our exclusive dedication to ALD gives us the most comprehensive understanding of the customer's needs and the ability to create the optimal solutions even to the most complicated process and manufacturing challenges. Our ALD technology makes the most advanced innovations come true, and offers a revolutionary way to improve the performance, quality, and manufacturing of existing products. Picosun's ALD solutions propel your industry to the future with one gigantic leap - performed with atomic layer precision!







PICOSUN™ R-series ALD systems

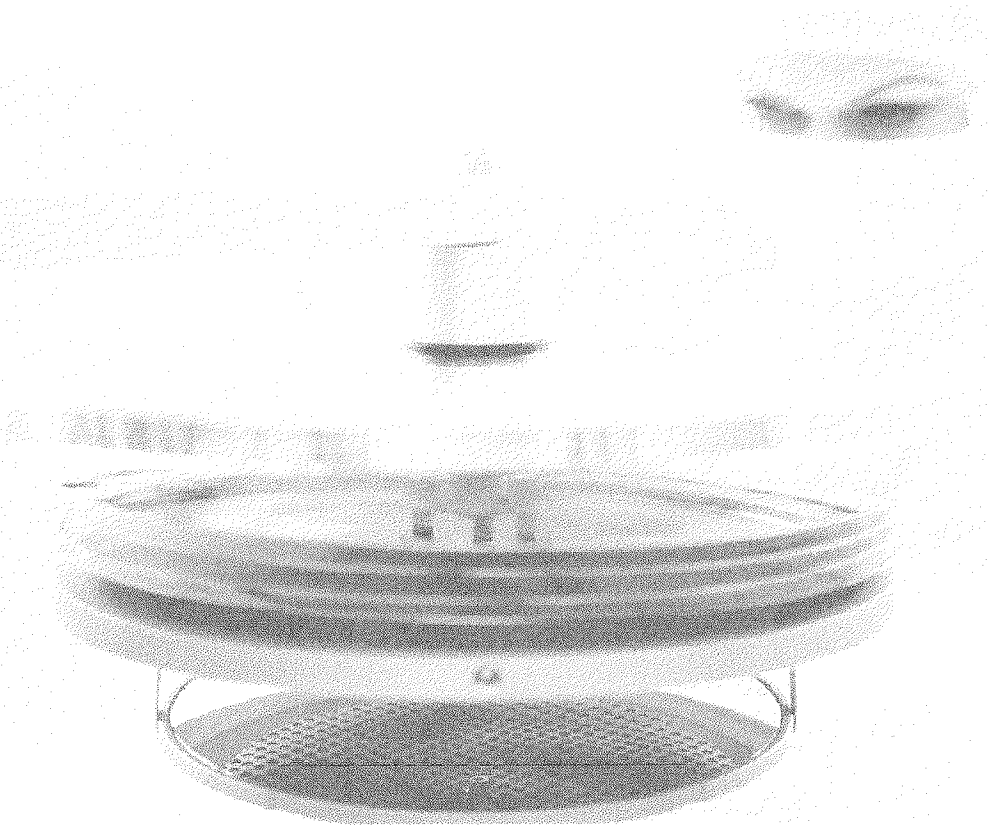
Manual or semi-automatic ALD tools for research, development, and small-scale pilot production.

The highest level research and development requires the best equipment. Picosun is the world leader in providing the most advanced ALD systems for R&D. PICOSUN™ R-series tools enable the deposition of the leading quality ALD films with excellent uniformity on all kinds of substrates, to the most challenging through-porous, ultra-high aspect ratio, and particle samples. Our highly functional and easily exchangeable precursor sources for *liquid, gaseous, and solid* chemicals enable particle-free processing of a wide range of materials on wafers, 3D objects, and all nanoscale features. Large number of individual, fully separated precursor inlets allow versatile precursor source selection already in the most basic PICOSUN™ R-series tool configuration.

The unique scalability of the PICOSUN™ R-series tools enables smooth transition from research environment into production setting with PICOSUN™ P-series ALD systems. As the core design features are the same in all PICOSUN™ reactors, this eliminates the typical technology gap between laboratory and real manufacturing environment. For universities, this invites corporate funding, when the novel innovations can be readily transferred into production.

Customer data showing examples of film thickness uniformities on 150 mm and 200 mm (6" and 8") wafers in PICOSUN™ R-series ALD tools.

Material	Non-uniformity [1σ]
Al_2O_3 (batch)	0.13 %
SiO_2 (batch)	0.77 %
TiO_2	0.28 %
HfO_2	0.47 %
ZnO	0.94 %
Ta_2O_5	1.0 %
TiN	1.10 %
CeO_2	1.52 %
Pt	3.41 %



PICOSUN™ R-200 Standard ALD System

Technical features

Substrate size and type	50 – 200 mm single wafers Max. 150 mm wafers in vertical batch of 5 - 15 pcs (depending on process) 156 mm x 156 mm solar Si wafers 3D objects Powders and particles Porous, through-porous, and HAR samples
Process temperature	50 - 500 °C, higher on request
Substrate loading options	Manual loading with a pneumatic lift Semi-automatic loading with a load lock and a magnetic manipulator arm
Precursors	Liquid, solid, gas, ozone Up to 6 sources with 4 separate inlets
Weight	350 kg
Dimensions (W x H x D)	Depending on options Minimum 146 cm x 146 cm x 64 cm Maximum 189 cm x 206 cm x 111 cm
Options	PICOFLOW™ diffusion enhancer, integrated ellipsometer, QCM, RGA, N_2 generator, gas scrubber, customized designs, glove box compatibility for inert loading
Acceptance criteria	Standard tool acceptance criteria with Al_2O_3 process