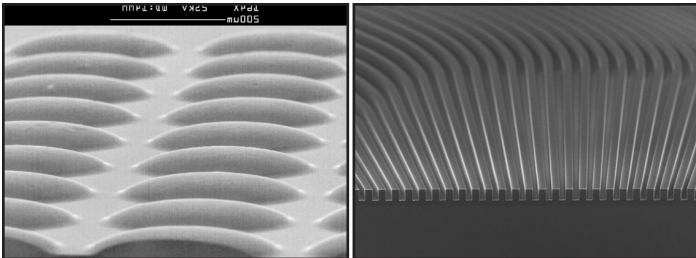


## Plasma Processes for Photonic Devices

SPTS Technologies is an industry-leading supplier of etch and deposition equipment for the manufacturing of silicon and compound semiconductor devices for MEMS, RF, power and optoelectronic applications.

Our expertise in wafer processing for photonic applications stretches back over 20 years, with etch and deposition processes for planar waveguides, microlenses, photonic ICs, LEDs and LASERs. With the resurgence of the optical communications industry to meet ever-growing demands for faster data speeds, SPTS has seen an up-tick in demand for their etch and deposition processes for optical components and systems.



*Fused silica microlenses*

*SiON waveguide*

Typical applications include deep dielectric etching, smooth etch sidewalls, PECVD of thick (doped and undoped) dielectric layers, and metal deposition for electrical contacts or via seed layers.

Our global network of sales and service offices provides world-class local support to all our customers throughout Asia, North America and Europe.

### SPTS PRODUCTS

#### Omega® ICP

Module for etching a wide variety of materials for photonic applications, such as GaAs, InP, GaP, SiN<sub>x</sub> and GaN.



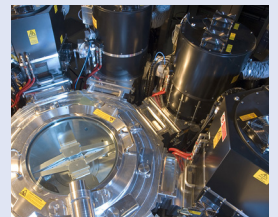
#### Omega® Synapse

Module with 10x ion density of ICP, designed to etch strongly bonded materials such as SiO<sub>x</sub>, glass, LiNbO<sub>3</sub>, SiC, GaN and sapphire.



#### Omega® DSi-v / Rapier

Established silicon DRIE modules for low loss, smooth sidewall etch profiles.



#### Delta™ PECVD

Deposition of α-Si, SiO<sub>x</sub>, SiN and SiON layers with unparalleled RI, stress and thickness uniformity control at low deposition temperatures.

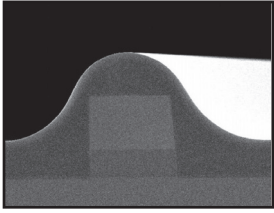


#### Sigma® PVD

High productivity metal layer deposition, for UBM/RDL

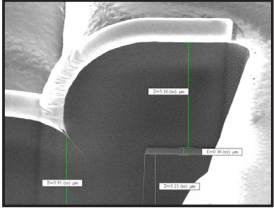


# PECVD Processes for Photonics



## Silicon Oxide / Silicon Oxynitride Deposition

Thick layers of silicon oxide or silicon oxy-nitride (for example in waveguide manufacturing) require long deposition times and regular chamber cleans. To avoid chamber damage during cleaning, SPTS offers a novel remote plasma cleaning configuration, with end-point control to increase productivity. Film stress <math>< 10\text{ MPa}</math> is achieved in  $\geq 6\mu\text{m}$  films, with refractive index tuneable independently of stress.



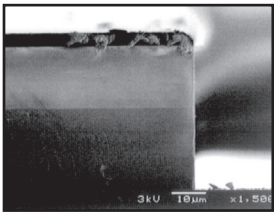
## Amorphous Silicon Deposition

Typically used for infra-red waveguide applications where silicon oxide is too lossy, amorphous silicon can be deposited at temperatures  $< 400^\circ\text{C}$  using PECVD with a silane plasma, which results in  $\alpha\text{-Si:H}$  film. Minimizing hydrogen content of the films by careful precursor selection and process tuning is key to obtaining low optical loss.

## Silicon Nitride Deposition

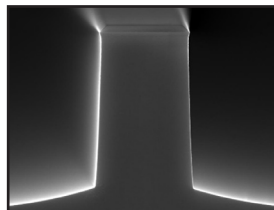
SiN films are widely used as anti-reflective coatings in active photonic devices such as VCSELs. Within wafer and wafer to wafer refractive index and thickness non-uniformities are maintained at  $< \pm 2\%$  using the Delta™ PECVD system. PECVD SiN is also increasingly used for bow compensation where substrates are kept essentially flat by equalizing the film stresses on both sides, thereby easing subsequent lithography steps.

# Etch Processes for Photonics



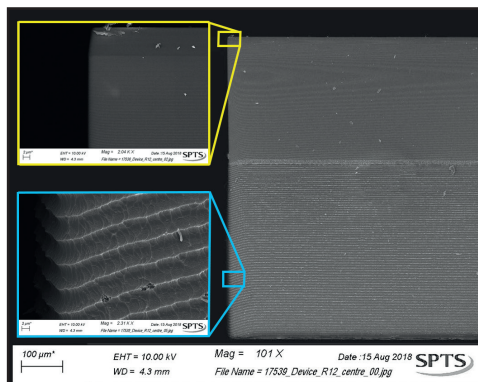
## Silicon Oxide Etching

The Synapse etch system has a unique design which increases the ion density for high oxide etch rates, and the chamber is heated to reduce by-product deposition on the chamber walls to increase MTBC. Deep oxide etches to  $> 100\mu\text{m}$  can be achieved.



## Compound Semiconductor Etching

SPTS offers both its standard ICP and Synapse™ technology for etching compound semiconductors. These etch processes can be used to create smooth, vertical or tapered structures to form waveguides, microlenses, modulators, LEDs, and LASERS.



## Silicon Etching

SPTS is a recognized leader in deep silicon etching. Our processes offer smooth sidewalls with high etch rates, controlled profile and unique end-point options. Our Rapier DRIE system processes wafers up to 12" in diameter, and can be used for etching  $\text{Si-SiO}_x$  stacks.

**SPTS Technologies**, a KLA company, designs, manufactures, sells, and supports etch, PVD, CVD and MVD® wafer processing solutions for the MEMS and sensors, advanced packaging, photonics, high speed RF, and power device markets. For more information, email [enquiries@spts.com](mailto:enquiries@spts.com) or visit [www.spts.com](http://www.spts.com)