Emerging big data applications are now driving an ever-growing demand for faster data speeds, which can only be delivered by optical communication technologies. This has driven the demand for etch and deposition processes for optical components and systems.

SPTS (now a Division of KLA Corp.) has been manufacturing wafer processing equipment for photonic applications for over 20 years, with etch and deposition processes for planar waveguides, microlenses, photonic ICs, LEDs and LASERS.

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

**PROCESS MODULES**

**SPTS Omega® ICP**
Module for etching a wide variety of materials for photonic applications, such as GaAs, InP, GaP, SiN, and GaN.

**SPTS Omega® Synapse**
Module with 10x ion density of ICP, designed to etch strongly bonded materials such as SiO, glass, LiNbO, SiC, GaN and sapphire.

**SPTS Omega® Dsi-v / Rapier**
Established silicon DRIE modules for low loss, smooth sidewall etch profiles.

**SPTS Delta™ PECVD**
Deposition of a-Si, SiO, SiN and SiON layers with unparalleled RI, stress and thickness uniformity control at low deposition temperatures.

**SPTS Sigma® PVD**
High productivity metal layer deposition, for UBM/RDL
DEPOSITION

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 <10 MPa is achieved in ≥6μm 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°C using PECVD with a silane plasma, which results in α-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 <±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

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 >100μm can be achieved.

Compound Semiconductor Etch Processes
SPTS offers both its standard ICP and Synapse™ technology for etching compound semiconductors. These etch processes can be used to created 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 offers 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 Si-SiOx stacks.