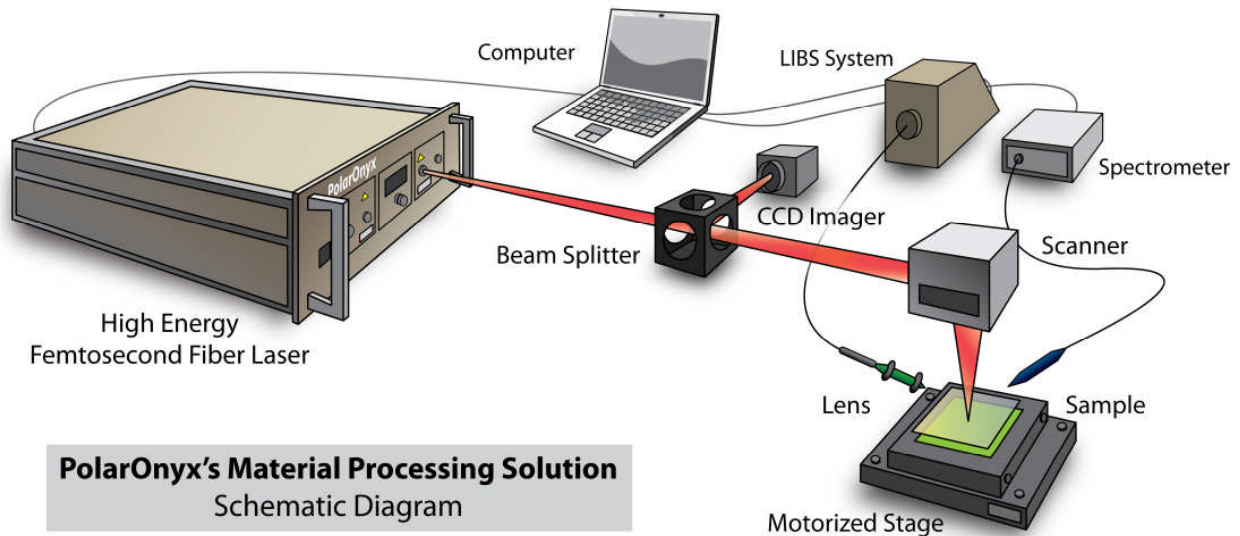


## Femtosecond Fiber Lasers Based Material Processing Solution

### Overview

Femtosecond (fs) fiber lasers continue to grow in popularity over conventional solid state lasers. A turn-key fs fiber laser solution offers unprecedented features of compactness, low maintenance, and low power consumption. At PolarOnyx, our mission is to provide customers with the highest quality, cutting edge fiber laser products and support. As the leader in high energy fiber lasers, we have developed a material processing solution for customers working on material microstructuring, waveguide writing, surface texturing and bonding, micro and nano surgery, hole drilling, coating removal, bio-sample engineering, spectroscopy and more. This complete solution can be used for a variety of materials, such as metals, glasses, ceramic, semiconductor materials, tissues, plastics, and polymers.

This system relieves researchers and engineers in material processing engineering of the expensive and cumbersome usage of different lasers and instead provides an all-inclusive laser source solution. As a complete material processing solution, this system consists of a high energy 1 micron fs fiber laser (**Uranus 1000** or **Uranus 2000** or **Uranus 3000**) with second harmonic (green), third harmonic (UV), and fourth harmonic generation (deep UV). Additionally, the solution includes a spectrometer, Laser Induced Breakdown Spectroscopy (LIBS), CCD imaging system, and scanning systems with an optimized process for immediate usage. Below is a schematic diagram of the material processing solution system.



The fs fiber laser is based on our standard micro-J level fs fiber laser (**Uranus High Energy Series**) with SHG (efficiency >40%), THG (efficiency >10%), and FHG (efficiency >20%). The pulses of harmonic generations have comparable pulse widths with fundamental pulses. In combination with a rotary scanning system and linear motorized stages, any 1D, 2D, and 3D pattern can be written on the samples via a computer controlled process. Implement an embedded CCD imager and spectrometer or LIBS system for real-time monitoring of the process. The LIBS System provides a powerful way to do real-time characterization of the processed local materials.

### Key features of PolarOnyx's Material Processing Solution

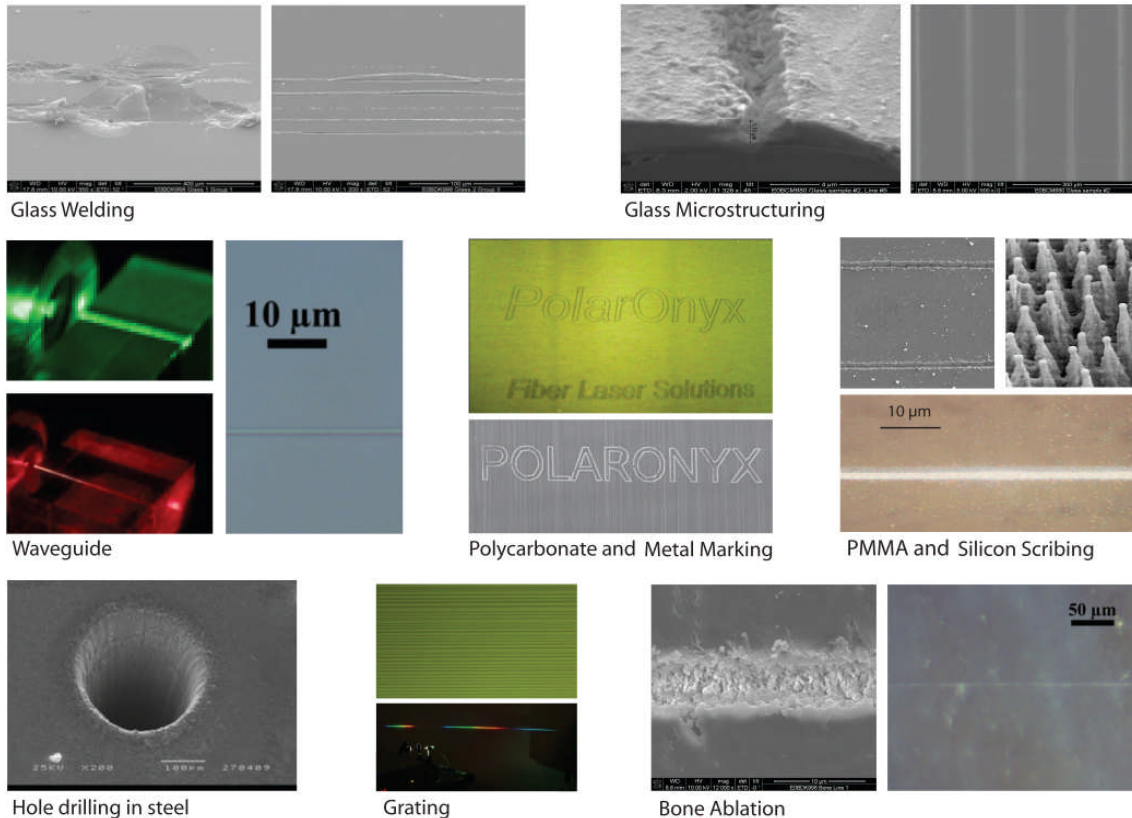
- Maintenance-free high energy fs fiber lasers (Selections from 1 to 100 micro-J available)
- Additional wavelength selection – Deep UV, UV, VIS, 1  $\mu\text{m}$ , 1.55  $\mu\text{m}$ , and 2  $\mu\text{m}$
- Pulse repetition rate from 1 Hz to a few MHz
- Integrated scanning systems with computer control
- A variety of material processing formulas
- Real-time monitoring
- Strong technical support

### Customer Support and Application

The material processing solution allows researchers and engineers to not only access multiple wavelengths for various applications but also reduce time-consuming process development. PolarOnyx's application engineers can help customers select the right laser and scanners, develop and optimize the processes, and continue post sales technical support. Moreover, PolarOnyx has application labs for customers to run preliminary experiments and is open to collaborating with customers closely for developing complicated material processing procedures. Successful applications include:

- Waveguide writing inside glasses (2D and 3D)
- Surface microstructuring and patterning on metals, glasses, ceramic, polymers, and tissues
- Anti-reflection surface texturing
- Tissue and cellular imaging, welding, and ablation
- Material bonding
- Hole drilling
- Coating removal
- Microfluidic channels and devices
- Writing optical gratings
- Cutting tissues, glasses, and metals
- Time-resolved and coherent Anti-Stokes spectroscopy and microscopy
- Cellular, molecular, and micro imaging and biopsy

Manufacturing application images of the fs fiber laser based material processing solution:



Through partnering with Stanford University, Harvard University, University of California, Davis, Purdue University, NIST, and more, PolarOnyx has built up credibility in providing our customers with the best-in-class technical supports and value added services.

**The future of ultrafast fiber lasers is beyond our imagination. The possibilities are endless.**