Optical Edge & Angle Polishing

Valley Design provides optical edge polishing &
angle polishing of various materials

Fused Silica, Silicon, Silicon/Oxide Hybrids, Sapphire,
$LiNbO_3$ (Lithium Niobate), $LiTaO_3$ (Lithium Tantalate),
Pyrex, Phosphate Glass

Flat Edge, or 7° & 8° Angles / Single or Opposing Edges
Waveguides, Edge Mirrors, VOA, AWG,
Dynamic Gain Equalizers, Beamsplitters

Many manufacturers of optical and optoelectronic devices such as Waveguides, Edge Mirrors, VOA, AWG, Dynamic Gain Equalizers and Beamsplitters are beginning to acknowledge the effect end face polishing has on optimizing the optical performance of these devices. Valley Design provides flat edge and angled edge polishing of various substrate materials including Fused Silica and Silicon and others which are typically used in these and other optical devices.

End face refers to the depth x width of the cross sectional area of a substrate with depth, width and length. Typically, the area is 9 – 40 mm x 0.7 – 1 mm, and may incorporate, for example, an 8 degree angle relative to the normal length x width plane. Optical waveguides begin and end at these faces. Traditionally, these edges have been diced, leaving a chipped edge. However, by utilizing Valley's new technology, which achieves an optical quality edge surface finish with chipping of less than 1 micron, improved optical performance can now be realized. Valley has also developed state-of-the-art techniques to measure edge plane orientation.

One of the major challenges of edge polishing involves compensating for the step height differential which occurs during polishing hybrids of Silicon and Oxide layers. This can also occur with epoxy filled waveguide structures. Other issues include poor flatness results, and excessive rounding. **Valley Design has successfully overcome these obstacles and meets the following typical optical specifications:**

Edge Chips < 1 micron
Surface Finish < 10-15 Angstroms (10/5 Scratch/Dig)
No Visible Scratching Under 50X Magnification
No Visible Defects in Silica Layer Under 500X Magnification
Edge Plane Orientation +/- .1 degree
Oxide Rolloff < 1000 Angstroms
Flatness < 3.5 microns per 10 mm

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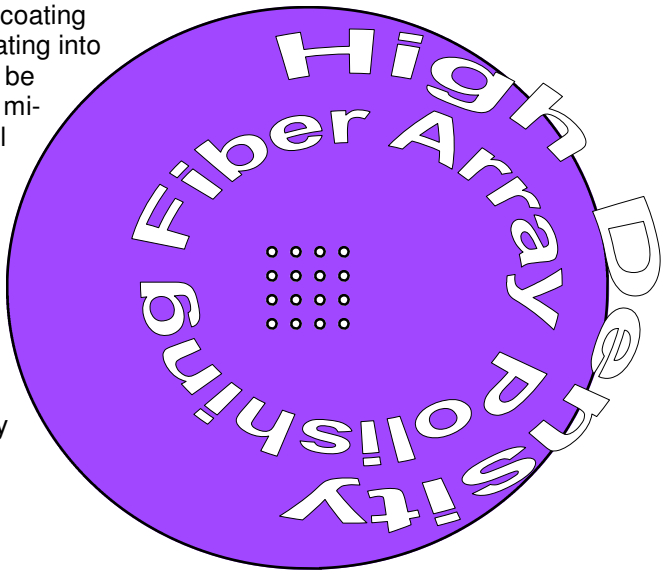
Precision Polishing of High Density Fiber Arrays

Valley Design polishes high density fiber optic arrays to high quality optical specifications with fiber end surface finish to within a few nanometers, and array flatness within light band range (1/2 wave or better).

Ensuring top performance of fiber optic high density arrays, typically used in switching applications, presents many challenges to manufacturers of these devices, particularly in the assembly and polishing operations. Also used as stand-alone devices, fused arrays offer very high coupling efficiency, high chemical resistance and high damage threshold. Tens, hundreds or even thousands of optical fibers must be assembled with positioning tolerances within several microns. These fibers, each consisting of a 5 to 10 micron core with cladding and coating surrounding it, must then be molded together, terminating into a planar surface. The ends of these fibers must then be polished to near perfection, with flatness within a few microns from edge to edge, and very high quality optical surface finishes to < 5 angstroms. Surface finish and flatness is critical in order to maintain signal integrity and minimize loss. Traditional optical polishing techniques cannot achieve these high-performance specifications.



Valley Design has, after extensive R&D efforts, developed the process and equipment fixturing required to provide these services. Valley has closely collaborated with several customers to provide prototype to production high quality polishing of fiber optic arrays.

Valley Design also provides and processes numerous types of substrate materials used in these applications including Fused Silica, Quartz, Pyrex, Glass, GaAs, $LiNbO_3$, InP, Sapphire, Silicon, Ceramics and many others. Valley can lap, polish, dice and edge or angle polish these parts to your specifications. Coating and metallization services are also provided.

www.valleydesign.com

Applications:

Fiber optics, fiber optic arrays, waveguides, optical switches, WSXC (Wavelength Selective Cross-connects), matrix optical switches, transparent optical cross-connect switches, precision polished NxN switches, MEMS (Micro Electro-Mechanical Systems) devices, beamsplitters, fiber beam combiners.