

# Optical Fiber Cladding Removal

Plasma processing of optical fibers has been demonstrated as a crucial manufacturing step in the development of wavelength division multiplexing (WDM) and dense wavelength division multiplexing (DWDM) systems. The plasma process is employed to remove the cladding from the fiber. Once the cladding is removed, the core of the fiber is exposed to ultraviolet light from a laser which induces a Fiber Bragg grating inside the fiber core. The process results in periodic variations of the refractive index of the core. The refractive index variations allow the fiber to separate different wavelengths of light.

A critical requirement in the removal of the fiber cladding is to completely remove the urethane acrylate polymer while maintaining the intrinsic strength of the glass core. Thus tight control of the cladding removal process is required to minimize the plasma etch of the glass core.

A carbon tetrafluoride and oxygen plasma was used to create a chemically active plasma consisting of fluorine and oxygen radicals. These highly reactive chemical species diffuse to the fiber cladding surface and react producing gas phase byproducts such as carbon dioxide, carbon monoxide, and hydrogen fluoride.

Figure 1 below highlights the effect of the plasma process on the intrinsic strength of the fiber and the importance of process control. The graph shows that increased plasma time results in etching of the glass core and thus reduces the fiber strength.

Important process parameters that are tightly controlled are time, power, and pressure. These parameters are selected based upon the specifications of the fiber including cladding material and cladding thickness. For the data displayed below, the intrinsic strength of the fiber is 700 kpsi, the fiber was 250mm in diameter, and the glass core was 125mm. For process times less than 330 seconds, the cladding on the fiber is not completely removed. Incomplete removal of the cladding can result in fiber damage during the grating writing step. The patent pending process is an enabling technology for fiber Bragg grating manufacturing.

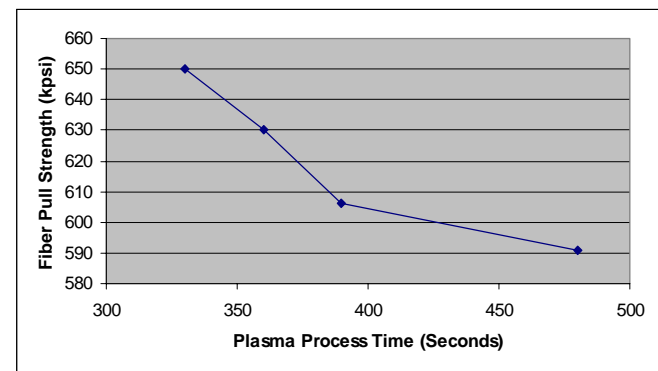
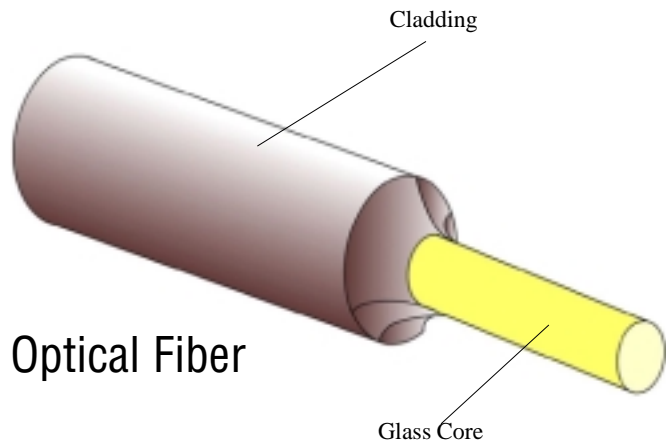
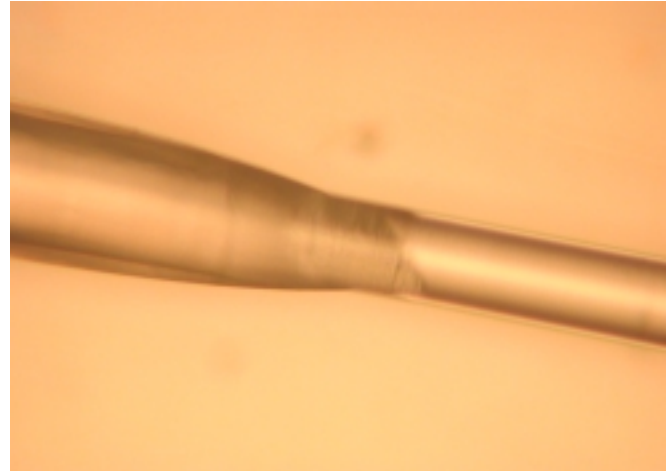


Figure 1

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