Cutting and handling PM fibers

Introduction

Polarization maintaining (PM) optical fibers are designed with stress rods in the cladding to provide birefringence properties. By design, the PM features present in the cladding induce a significant stress field overlapping with the area between the core and the stress rods. The magnitude of the stress field scales with the diameter of the cladding. This application note is proposing a safe and reliable procedure to cut large format PM fibers of 400 µm and larger through the stress field while preserve the quality and integrity of the fiber.

Recommended Cutting Procedure

To prepare, cut and handle PM fibers from the Coherent shipping spool, we recommend using a hand cleaving tools such as a sharp diamond, carbide or ceramic blade as illustrated in Fig. 1. At least one or both sides of the fiber surrounding the region to be cut can be taped to a clear, straight surface. The fiber must remain straight and under a small amount of tension. Once the fiber is secured, the user can simply scribe the surface of the fiber with the blade, directly through the coating (yellow arrow on Fig. 1). Remove the tape and gently pull on each side of the scribed location (or apply a very small angle), the fiber will separate/cut in a safe manner, without inducing shock-waves through the glass. As depicted in Fig. 2, any other cutting tool/technique e.g. scissor, clamps and finger-snapping should be avoided from being used on PM fibers. Once the fiber is cut, the user can follow conventional techniques of coating stripping, cleaning and fiber cleaving with standard equipment.

Risks of Destructive Fiber Cutting

Failure to adopt blade tools to cut PM fibers (Fig. 1) significantly increases the risk of damaging the structure of the fiber. Any severe compression perturbations applied to the stress-field will result in failures, the most common ones, visible in Fig. 3, include longitudinal crack formation, propagation of the crack several inches into the fiber and brittle fiber.

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Fig. 1: Recommended cutting tool for PM fibers (sharp diamond, carbide or ceramic blade)

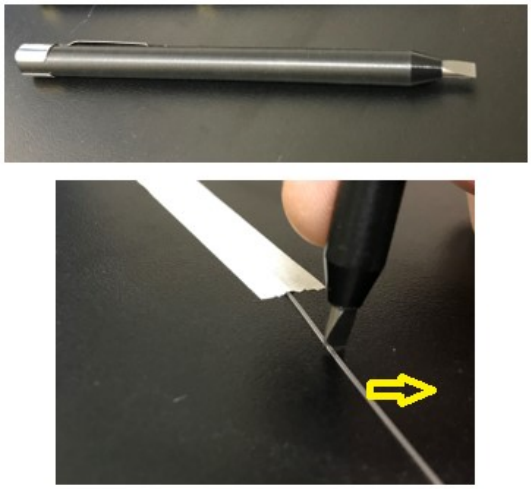

Fig. 2: Destructive fiber cutting techniques to be avoided including scissors, clamps or finger snapping (L to R)

Fig. 3: Fiber end facet images showing crack induced by destructive cutting (L) and defect-free result blade-cutting (R)