

Chlorine Pretreatment Effect on Mechanical Properties of Optical Fiber Glass

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Abstract : The principal ingredient of an optical fiber is quartz glass. The quality of the optical fiber decreases if impure foreign substances are attached to its preform surface. If residual strain inside a preform is significant, it cracks with a small impact during drawing or transporting. Furthermore, damages and unevenness on the surface of an optical fiber base material break the fiber during drawing. The present work signifies that chlorine pre-treatment enhances mechanical properties of the optical fiber glass. FTIR (Fourier-Transform Infrared Spectroscopy) results show that chlorine gas chemically modifies the structure of silica clad; chlorine is known to soften glass. Metallic impurities on the preform surface likely formed volatile metal chlorides due to chlorine pretreatment at elevated temperature. The chlorine also acts as a drying agent, and therefore the preform surface is anticipated to be water deficient and supposedly avoids particle adhesion on the glass surface. The Weibull analysis of long length tensile strength demarcates a substantial shift in its knee. The higher dynamic fatigue n-value also indicated surface crack healing.

Keywords : mechanical strength, optical fiber glass, FTIR, Weibull analysis

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