

Single-mode double-clad fluoride optical fiber



Article Overview

Single-mode double-clad fluoride optical fibers combine a rare-earth-doped single-mode core with a multimode inner cladding, enabling high-power, efficient fiber lasers and amplifiers across visible and mid-infrared wavelengths.

Structure and Materials

A single-mode double-clad fluoride fiber consists of three main regions:

- Core: A small-diameter single-mode core, typically doped with rare-earth ions such as Pr^{3+} , Ho^{3+} , or Dy^{3+} , which supports diffraction-limited laser output .
- Inner Cladding: A larger multimode cladding surrounding the core, designed to guide pump light efficiently into the core for absorption by the active ions .
- Outer Cladding: A low-refractive-index layer that confines both the core and inner cladding light, ensuring efficient pump guidance and minimal loss . Fluoride glasses such as ZBLAN ($\text{ZrF}_4\text{-BaF}_2\text{-LaF}_3\text{-AlF}_3\text{-NaF}$), InF_3 , and AlF_3 are commonly used due to their low phonon energy, high rare-earth solubility, and transparency in the mid-infrared and visible ranges .

Operational Principles

- Single-mode operation: The core supports only the fundamental mode, producing high beam quality ($M^2 \sim 1.0$) suitable for precision applications .
- Cladding pumping: Pump light is injected into the inner cladding, which surrounds...

Article Content

Apr 20, 2026

Double-Clad Fiber (DCF) | Castor

Our DCFs are optimized for a wide selection of wavelength range. The inner cladding diameter is tailored

Jun 30, 2026

Single-mode visible laser oscillation in Pr-doped double-clad ...

We successfully generated a visible Q-switched pulse train at 636 nm in a Pr-doped double-clad structured waterproof

Dec 30, 2025

Fiber Cladding – core, cladding modes, double-clad fiber, index ...

The cladding of an optical fiber is the area outside the core, where the refractive index is constant.

Oct 26, 2025

Laser fibers – Le Verre Fluoré

LVF also offers double-clad single-mode fibers in order to enable use of multimode pump diodes. These

Jun 26, 2026

Single mode fibers – Le Verre Fluoré – Fiber Solutions

Since the discovery of ZBLAN glasses in 1974, Le Verre Fluoré has worked to develop a large range of single mode fluoride optical

Dec 05, 2025

SM-GDF-5/130, Single Mode Passive Double Clad Optical Fiber

Datasheet Components & Accessories SM-GDF-5/130, Single Mode Passive Double Clad Optical Fiber Coherent's SM-GDF-5/130

Sep 25, 2025

Double-clad fiber

Double-clad fiber (DCF) is a class of optical fiber with a structure consisting of three layers of optical material instead of the usual

Jun 13, 2026

Single-mode visible laser oscillation in Pr-doped double-clad ...

A Pr-doped double-clad structured waterproof fluoride glass fibre (Pr:DC-WPFGF) was successfully drawn, and the

Jan 27, 2026

Double-clad optical fiber as a single-point sensor of imaging quality ...

The optimal imaging quality, primarily affected by the accurate focusing, is determined by maximizing the ratio of the

Jan 04, 2026

Single mode fibers - Le Verre Fluoré - Fiber Solutions

Single clad and double clad rare earth doped fluoride fibers are widely used to generate mid infrared lasers, but also visible lasers.

Oct 26, 2025

Double-clad Fibers

LVF offers a range of rare-earth doped double cladding single-mode and multimode fluoride fibers for high power laser generation.

Jun 01, 2026

Visible Q-switched pulse laser oscillation in Pr-doped double-clad ...

In 2016, we developed a Pr-doped double-clad structured waterproof fluoride glass fiber (Pr:DC-WPFGF) and

Dec 22, 2025

Watt-level visible laser in double-clad Pr $3+$ -doped fluoride fiber ...

To conclude, we report on a concept of watt-level, high brightness visible lasers based on Pr $3+$ -doped double-clad fluoride fibers with

Jul 24, 2026

High-power tunable red laser based on double-cladding Pr $3+$ -doped fiber ...

These demonstrates that using double-cladding fiber to achieve high power lasers is a viable option. In this work, our

Feb 22, 2026

Fluoride glass-based optical fibers

Fluoride glass-based optical fibers (abbreviated as fluoride fibers) are fabricated using unique drawing processes. Fibers based on

Feb 27, 2026

Single Mode Air-Clad Single Crystal Sapphire Optical Fiber

The observation of single mode propagation in an air-clad single crystal sapphire optical fiber at wavelengths at and

Jun 29, 2026

Optical fibers and modules

Our ytterbium-doped double-clad fibers offer the largest single-mode cores in the world, enabling amplification to unprecedented

Mar 10, 2026

Single-Mode Optical Fiber

Distributed fiber optic sensors are made using optical fibers. The optical fibers used for SHM include single-mode and multi-mode

Apr 29, 2026

Single Mode Fluoride Fiber Optic Patch Cables

Our single mode fluoride fiber patch cables are designed for low-loss transmission in the mid-IR spectral range. They incorporate

Aug 23, 2025

Double-Clad Fiber (DCF) | Castor

Our double-clad fibers are available for different single-mode operating wavelengths and for different inner cladding diameters.

Nov 06, 2025

Fiber Cladding – core, cladding modes, double-clad fiber, index ...

A double-clad fiber has an additional inner cladding (or pump cladding) located between the core and the outer cladding. This inner

Sep 06, 2025

Multimode Fluoride Glass Optical Fiber

Features Fluoride Glass Fibers Manufactured at Thorlabs' Fiber Draw Facility
Fluorozirconate (ZBLAN) † for 285 nm - 4.5 μm

Dec 16, 2025

Single-Mode Optical Fiber Couplers Made of Fluoride Glass

We demonstrate the fabrication of all chalcogenide single-mode optical fiber couplers including broadband couplers,

Aug 27, 2025

PM-GDF-5/130, Single Mode Passive Double Clad Optical Fiber

Coherent's PM-GDF-5/130 fibers are optimized for passive applications requiring single-mode operation and exceptional beam

Sep 15, 2025

Single Mode Fluoride Glass Optical Fiber

Thorlabs' single mode fluoride glass fibers are manufactured in-house and have world-class purity, precision, and strength. For more

Sep 07, 2025

Fluoride and chalcogenide glass fiber components for mid-infrared ...

Building upon a comprehensive overview of the mechanical, thermodynamic, and optical properties of fluoride and

Contact Us

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