

Application of Novel Hollow-Core Optical Fiber



Article Overview

Hollow-core optical fibers enable ultra-fast, low-loss light transmission and are transforming telecommunications, high-power laser delivery, sensing, and advanced photonics applications.

Telecommunications and Low-Latency Networks

Hollow-core fibers (HCFs) guide light through an air or vacuum core, allowing photons to travel near the speed of light in vacuum, significantly faster than in conventional silica fibers. This reduces latency by 30–50% and supports broadband, low-loss transmission, making HCFs ideal for long-haul, high-speed communication networks. Their low nonlinearity also minimizes signal distortion, improving data integrity over multi-kilometer links.

High-Power Laser Delivery

HCFs can transmit kilowatt-class laser beams over kilometer distances with minimal loss and preserved beam quality. Recent demonstrations have shown 2.2 kW single-mode beams transmitted through anti-resonant HCFs with 95% power retention, enabling high-brightness, narrow-linewidth fiber laser delivery for industrial manufacturing, laser machining, and scientific research.

Sensing and Gas-Based Applications



Article Content

Hollow-core fiber gas lasers | Light: Science & Applications

These novel lasers are characterized by hollow-core structure, providing an ultralong and tiny interaction region for

Recent Advances in Hollow-Core Optical Fibers

Hollow core fibers (HCFs) guide light in a central void running down their length, thereby avoiding the strong light: glass

Hollow-Core Fibers (HCF): The Next Frontier in Optical

Published by: Research & Development Department, Technologie Optic.ca Inc.,
September 2025

Hollow-Core Fiber Technology: The Rising of “Gas Photonics”

Since their inception, about 20 years ago, hollow-core photonic crystal fiber and its gas-filled form are now

Editorial: Advances and Applications of Hollow-Core Fibers

As we mark the 60th anniversary of the suggestion by Marcatili and Schmeltzer to use hollow waveguides for long

Hollow-Core Optical Fibers

The review Revolver Hollow-Core Optical Fibers by the Fiber Optics Research Center (FORC), in Moscow,

Emerging Trends in Optical Fiber: Hollow-core and Multicore Fibers

Discover the latest optical fiber trends in 2024: Learn how hollow-core and multicore fibers will play a key role in

Hollow-Core Fiber: Next-Gen Optical Communication

Explore hollow-core fiber technology for faster, low-loss optical communication and high

Hollow core fiber cable technologies

Hollow core fibers (HCF) are innovative optical fibers having the potential to break the limits of conventional optical

Beyond Silica: Novel Uses for Hollow-Core Fibers

In addition to beating conventional telecom fiber on loss and latency, hollow-core fibers are enabling new approaches

Hollow-Core Optical Fibers: Recent Advances and Applications

This Special Issue aims to provide a comprehensive overview of the state-of-the-art developments, understanding, and diverse

(PDF) Hollow-Core Optical Fibers

Hollow core optical fibers are normally passive light transport components. In contrast, within this Letter, we

Advances in Hollow-Core Fiber Technologies and Applications

Hollow-core fibers (HCFs) have emerged as a well-established and rapidly evolving class of optical waveguides in which light is

Hollow-Core Fiber

State of the art classical and quantum communication rely on standard optical fibers with solid cores to transmit light

Hollow-core microstructured optical fibers and their applications for ...

Abstract This chapter provides an overview of the potential of hollow-core microstructured optical fibers (HC-MOFs) for various

Studies for Practical Applications of the Hollow Core Fiber

Subsequently, we have conducted reliability tests, optimization of fusion splicing conditions, cable installation tests, and application

Fibers | Special Issue : Hollow Core Optical Fibers

Hollow core optical fibers are a specific type of glass fiber that, unlike conventional optical fibers, allow the guidance of an optical

Optical trapping of mesoscale particles and atoms in hollow-core ...

Since the first demonstration of optical trapping in HCF, hollow-core-fiber-based optical trap (HCF-OT) has become

Hollow-core optical fibers: current state and development prospects

The basic properties which determine the competitive advantages of hollow-core fibers and promising areas for their

Optical Fiber Technology | Hollow core optical fibers: progress in ...

This Special Issue invites submission of research work on hollow core fiber technology. It will address design,

Hollow-core breakthrough

In summary, the demonstration of hollow core fibres with lower loss and broader bandwidth than silica fibres

Novel hollow optical fibers and their applications in photonic devices ...

Novel photonic devices based on a new type of waveguide, hollow optical fibers (HOF), are described. Utilizing unique three layered

Hollow-core fibers

The use of optical fibers as sensor components has a long history that dates back to the early 1970s , . Since then, there has

Hollow-Core Fibers (HCF): The Next Frontier in Optical Communication

A comparison between solid-core silica fibers and hollow-core fibers is presented, focusing on telecom-relevant metrics. The article

Hollow Core Antiresonant Fibers: Novel Designs, Materials and ...

The development of hollow core optical fibers (HCs) based on the antiresonant optical principle is gaining a significant interest within

Novel hollow-core optical fiber transmits data 45% faster with record ...

But now, researchers from the University of Southampton and Microsoft claim to have made a breakthrough in HCF

(PDF) Hollow-Core Optical Fibers for Telecommunications and Data ...

Hollow-core optical fibers (HCFs) have unique properties like low latency, negligible optical nonlinearity, wide low-loss

Hollow-core photonic crystal fibers for Power-over-Fiber systems

In this context, here we widen the framework of hollow-core fiber-based beam delivery applications by demonstrating

Advances in Hollow-Core Fiber Technologies and Applications

We are pleased to invite you to contribute to this Special Issue highlighting recent advances in the science, engineering, and

Recent Advancement of Anti-Resonant Hollow-Core Fibers for ...

Specialty fibers have enabled a wide range of sensing applications. Particularly, with the recent advancement of anti

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