

Hollow Core Anti-Resonant Optical Fiber Preform



AI Overview

A hollow core anti-resonant optical fiber preform is a structured glass assembly designed to form hollow-core fibers that guide light through anti-resonant reflection, minimizing material interaction and optical loss.

Structure of the Preform

An anti-resonant hollow core optical fiber preform typically consists of three main components:

- Outer cladding:** A hollow cylindrical glass structure that provides mechanical support and defines the overall fiber geometry.
- Structural tubes:** Multiple thin glass tubes arranged radially inside the outer cladding. These tubes are smaller in diameter and thickness than the outer cladding and are bonded to its inner surface, forming the anti-resonant structure that confines light in the hollow core.
- Central support tube:** Positioned along the central axis of the preform, this tube supports the structural tubes and maintains the preform's integrity during fiber drawing. Its length is slightly shorter than the outer cladding to allow proper bonding and structural stability.

The arrangement of the structural tubes around the central support tube creates the anti-resonant effect, which reduces light leakage and allows single-mode guidance even in a multi-mode geometry.

Fabrication Process

The preform is fabricated by carefully bonding the central support tube to the surrounding structural tubes within the outer cladding. Precision in tube diameter, wall thickness, and alignment is critical to achieve the desired anti-resonant properties. Once assembled, the preform is drawn into a fiber under controlled heating conditions, preserving the hollow core and anti-resonant geometry.

Optical Principles

Hollow-core anti-resonant fibers (HC-ARFs) guide light primarily through anti-resonant reflection at the thin glass tubes surrounding the air core. This mechanism minimizes overlap between the light and the glass, significantly reducing material-induced loss, disper...

Article Content

Ultra-Low Loss Weakly Coupled Few-Mode Hollow-Core Anti-Resonant Fiber ...

ABSTRACT We propose and analyze a novel, ultra-low loss, weakly coupled few-mode hollow-core anti-resonant fiber that supports eight spatial modes as independent channels. The

WO/2024/099033 INTEGRATED HOLLOW-CORE OPTICAL FIBER

The method comprises manufacturing an initial preform by means of using a drilling method, and then feeding a gas into holes during a drawing process to perform pressurization

Exceptional polarization purity in antiresonant hollow-core optical fibres

In summary, we have demonstrated a family of single-mode hollow-core fibres that combine optical properties that approach those in free space with the practicality of long-distance flexible ...

Ultra-wideband and strong anti-bending performance of a hollow-core ...

Hollow-core anti-resonant (HC-AR) fibers play a crucial role in next generation communication. However, the high bending loss (BL) limits their practi

Enhanced coupling efficiency in single-mode to anti-resonant hollow ...

Abstract A novel method to enhance the coupling efficiency between single-mode fiber (SMF) and anti-resonant hollow-core fiber (ARHCF) by splicing tapered single-mode fiber (TSMF)

Delivery of Mid-infrared Femtosecond Laser by

This work pioneers the use of chalcogenide glass antiresonant hollow-core fibers for mid-infrared ultrafast laser applications, establishing a

Top 15 Fiber Optic Manufacturers (2026 Global Ranking)

Hengtong is a leader in Hollow-Core Fiber (HCF) and Quantum Communication. In 2025/2026, they achieved a breakthrough in anti-resonant hollow-core fiber, which allows for near

Monitorable hollow core optical fiber

Abstract: A monitorable hollow core (HC) optical fiber comprises one or more hollow core anti-resonant fiber (HC-ARF) segments and one or more monitoring segments alternately connected with the HC

Exceptional polarization purity in antiresonant hollow

Low-loss anti-resonant hollow core fibers (AR-HCF) are important for optical communication systems, photonics-enabled sensors, and exploring

Design of hollow-core anti-resonant optical fiber based on bragg ...

We proposed a novel hollow-core anti-resonant fiber, in which the anti-resonant element is composed of a Bragg structure. The confinement and bending losses are numerically simulated

Topic Categories | Optica

Hollow-core & anti-resonant fibers - from fundamentals to applications Hollow core fiber theories, designs (including AI-assisted), fabrication and ultralong-length uniformity and scalability, telecom

MWC 2026: China's Leading Optical Communication Companies

Hengtong Optic-Electric also achieved significant breakthroughs in the field of hollow-core fiber: its hollow-core anti-resonant fiber reduces transmission latency by 33% and has a bandwidth

YOFC Unveils HollowBand® Hollow-Core Fibre at MWC Barcelona 2026

Under the theme "HOLLOW IS INFINITE," Zhuang Dan introduced YOFC's anti-resonant hollow-core fibre and officially unveiled the HollowBand® brand. The presentation demonstrated how

Hollow-Core Fiber in Direct-Detection Optical Networks ...

This paper presents a comprehensive analysis of hollow-core fiber (HCF) for intensity-modulation and direct-detection (IMDD) optical networks, covering fiber-level physics, system-level

Ultralow Loss Hollow-Core Anti-Resonant Fiber With Elliptical Nested ...

This work presents an ultra-low loss hollow-core anti-resonant fiber design featuring a triple-nested cladding architecture with elliptical nested elements and six auxiliary compensation tubes located

Design of Hollow-Core Anti-Resonant Fibers Supporting

A nested semi-tube hollow-core anti-resonant fiber (HC-ARF) that can support the high-purity transmission of a few polarization-maintaining modes

Design and numerical analysis of a gap-compensated low loss hollow

el design for hollow-core anti-resonant fibers, specifically tailored to maximize light confinement and minimize losses. Through detailed simulations of key design parameters, such as the...

MWC 2026: China's Leading Optical Communication Companies

MWC 2026: China's Leading Optical Communication Companies Lead The World With Hollow-Core Fiber And AI Infrastructure. EINPresswire/ -- From disruptive breakthroughs in hollow

Ultra-High Capacity Transmission in Anti-Resonant Hollow Core Fiber

Abstract Anti-resonant hollow core fiber (AR-HCF) is a promising alternative for next-generation optical systems, given their theoretical potential of achieving low loss and ultra-low Rayleigh backscattering

Design and numerical analysis of a gap-compensated

In this work, we present a novel design for hollow-core anti-resonant fibers, specifically tailored to maximize light confinement and significantly

Design of Low Loss Semi-Circular Nested Tube Anti-Resonant Hollow Core ...

Hollow-core anti-resonant fibers (HC-ARFs) provide low-loss and broadband light guidance; yet, concurrently achieving low loss, structural simplicity, and strong single-mode operation remains

Multiple hollow-core anti-resonant fiber as a supermodal fiber ...

Abstract Hollow-core anti-resonant fiber technology has made a rapid progress in low loss broadband transmission, enabled by its much reduced light-material overlap. This unique

Broadband optical fibre with an attenuation lower than 0.1 ...

Microstructured air-core optical fibre provides unprecedented low-loss transmission of light signals over a broad wavelength window.

Multi-core anti-resonant hollow core optical fibre

We report the fabrication and characterisation of a multi-core anti-resonant hollow core fibre with low inter-core coupling. The optical losses were 0.03 and 0.08 dB/m at 620 and 1000 nm respectively,

Global Fiber Optic Cable Market Analysis | OPELINK

Q: What Is the Global Fiber Optic Cable Market Size in 2025-2026? According to CRU (Commodity Research Unit), global fiber optic cable demand reached approximately 5.50 billion core

Hollow-Core Anti-Resonant Fiber

Lumentum's Hollow-Core Anti-Resonant Fibers (HC-ARFs) are engineered for high-power laser transmission featuring high threshold for non-linear effects, exceptional beam quality, and low

Contact Us

For more information, pricing, or custom solutions, please contact us:

Website: <https://adikor.eu>

Email: info@adikor.eu

Phone: +33 6 48 37 92 15

Address: 12 Rue de la Paix, 75002 Paris, France

This document is for informational purposes only. Specifications subject to change without notice.

