

Fabrication Process of Passive Optical Devices



AI Overview

Passive optical devices are fabricated using precise photolithography, etching, and deposition techniques on carefully selected substrates to guide, split, and filter light without external power. Overview of Passive Optical Devices Passive optical devices are essential components in photonic integrated circuits (PICs), performing functions such as light guiding, splitting, combining, filtering, and coupling without requiring external power. Common examples include waveguides, directional couplers, multimode interference couplers, grating couplers, ring resonators, Mach-Zehnder interferometers, and arrayed waveguide gratings. These devices form the foundational infrastructure for optical signal routing and processing.

Substrate Selection The choice of substrate is critical for device performance. Common substrates include:

- Silicon (Si):** High refractive index, compatible with CMOS fabrication, ideal for waveguide-based devices.
- Silicon-on-Insulator (SOI):** Thin silicon layer on an insulating oxide, reducing propagation loss and improving light confinement.
- Silica (SiO₂) or Glass:** Excellent transparency in visible and near-infrared ranges, often used for planar lightwave circuits.
- III-V Semiconductors (e.g., GaAs, InP):** Occasionally used in passive circuits, especially when integration with active devices is needed.

Substrate properties such as refractive index, transparency, thermal stability, and mechanical stability directly affect optical performance and long-term reliability.

Fabrication Techniques

Photolithography Photolithography is the primary method for defining device patterns: A photoresist layer is applied to the substrate. UV light exposure through a mask transfers the desired pattern onto the resist. The resist is developed, creating openings for subsequent processing.

Etching and Deposition Etching: Removes material in patterned areas to form waveguides, t...

Article Content

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Abstract In this work, the design and fabrication of the polymeric passive all optical waveguides, directional coupler and micro-ring resonator as tunable all pass filtering devices based on

Photonic-integrated circuit fabrication and test approaches

Successful implementation of the fabrication methodology leads to improvements in performance, throughput, yield, and cost of a PIC. In addition, this standardized methodology provides freedom

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Passive optical components are devices that perform their function without requiring external power or active control. They are the fundamental

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To address these challenges, the NRC team, together with collaborators, has developed a suite of AI-enabled tools spanning design, fabrication, and characterization. Machine learning-assisted

Progress in Passive Silicon Photonic Devices: A Review

We survey the state of the art in fundamental building blocks, including strip, rib, and silicon nitride waveguides, with a focus on achieving ultra

Passive Silicon Photonic Devices: Design, Fabrication,

In 2015, Dr. Zhang joined Shanghai Jiao Tong University as an assistant professor and in 2019 became an associate professor. His research areas cover silicon

a) General fabrication processes for passive devices in

a) General fabrication processes for passive devices in silicon photonics. b) Cross-sectional schematic of a complete silicon photonics process flow from

Design and Fabrication of TGV-Integrated Passive Devices on a Glass ...

This paper presents the design, fabrication, and characterization of integrated passive device (IPD) on a borosilicate glass substrate using a through-glass via (TGV) process.

Fabrication Process of Passive Optical Devices

The manufacturing process begins with imaging and etching passive optical devices, such as waveguides and couplers, which guide and direct the light on the chip.

Optical Fiber Fabrication

Optical fiber fabrication refers to the processes involved in producing optical fibers from a preform, which includes methods for silica and polymer optical fibers, characterized by controlled extrusion and

Passive silicon photonic devices

In this chapter we will survey the key passive optical devices used in integrated photonic chips and compare the various approaches used to meet datacom application needs.

Silicon Photonic Platform for Passive Waveguide Devices ...

Silicon photonics has attracted tremendous interest from academia and industry, as the fabrication of the silicon family of photonic devices is mostly compatible with the microelectronics process using

Fabrication Process of Integrated Waveguides

This chapter focuses on the fabrication techniques of passive integrated waveguides. It first introduces the basic waveguide fabrication flow, including deposition, photolithography, and

Passive Optical Device

Abstract Passive devices and circuits are the bedrock and framework of integrated photonic chips. They route, integrate, and interfere with optical signals, forming the basis for all of the functionalities

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This presentation puts the spotlight on these optical-device fabrication processes. *1: Name of our device-fabrication company Our composite semiconductor devices based on either indium

a) General fabrication processes for passive devices in

Download scientific diagram | a) General fabrication processes for passive devices in silicon photonics.

Integrated Optics: Platforms and Fabrication Methods

Integrated optics is a field of study and technology that focuses on the design, fabrication, and application of optical devices and systems using

Nano-Fabrication Process | Passive Silicon Photonic

He earned his Ph.D. from the Huazhong University of Science and Technology, Wuhan, China. In 2015, Dr. Zhang joined Shanghai Jiao Tong University as an

Passive Silicon Photonic Devices: Design, Fabrication, and Testing

This important book is a practical guide to the design, fabrication, and testing of passive silicon photonic devices.

(PDF) Silicon Photonic Platform for Passive Waveguide

Second, typical fabrication processes for waveguide devices are introduced. Subsequently, a variety of passive waveguide devices, operating at

Silicon Photonic Platform for Passive Waveguide Devices: Materials ...

First, the material and waveguide properties are reviewed. Second, typical fabrication processes for waveguide devices are introduced. Subsequently, a variety of passive waveguide

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