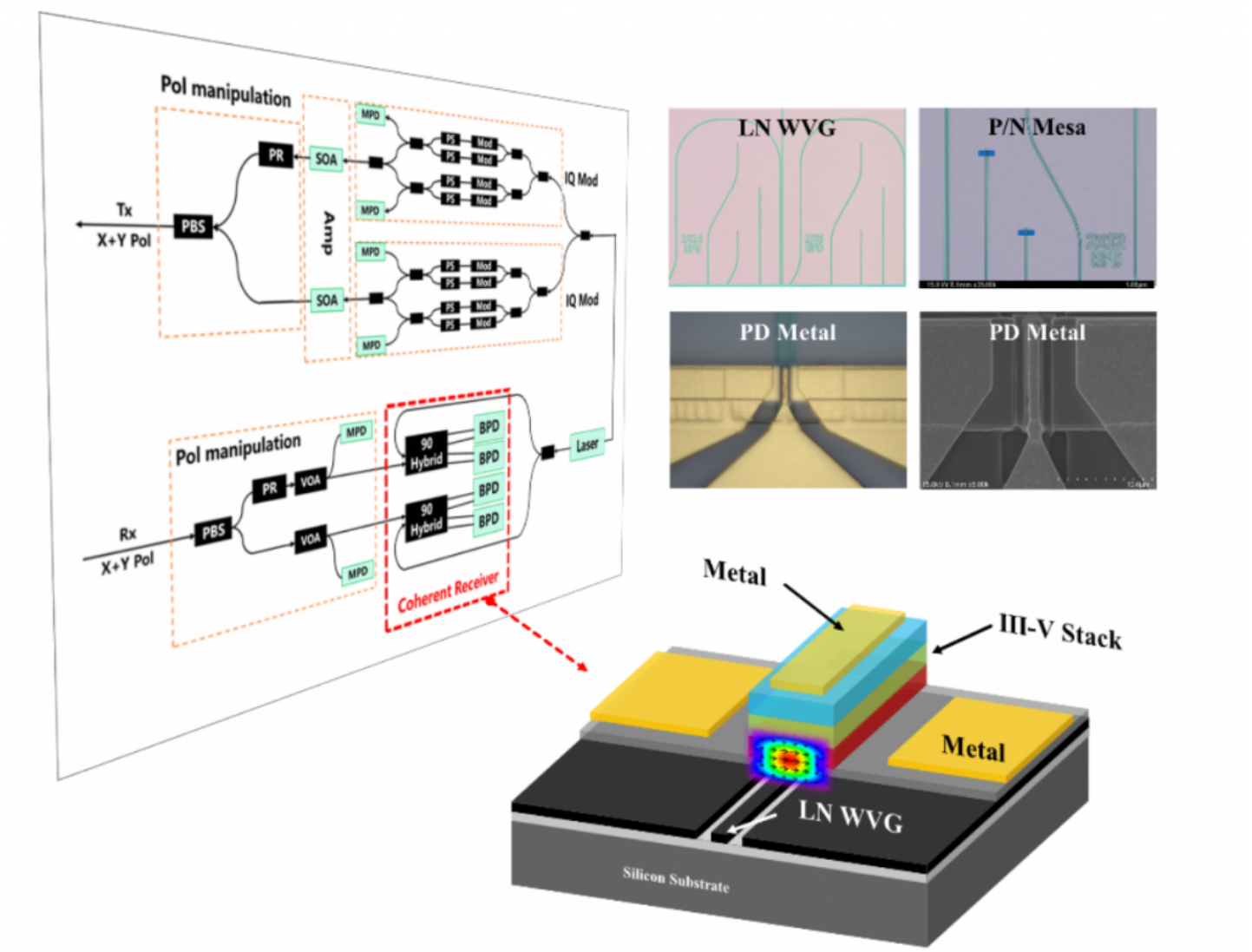
TranSpread Has Reported Ultra-wideband Heterogeneous Integrated Photodiodes on Thin-film Lithium Niobate Platform



Fayetteville, Georgia Oct 5, 2023 (Issuewire.com) - Thin-film lithium niobate (TFLN) is considered as a promising platform for photonics integrated circuits due to its tight mode confinement, high nonlinear efficiency and wide transparency window. Chinese scientists have recently reported an ultra-wideband waveguide-coupled photodiode on the TFLN platform. This photodiode achieved a 3-dB bandwidth of 110 GHz and a responsivity of 0.4 A/W at 1,550 nm wavelength. This study is important for the development of large-scale, multifunctional, and high-performance TFLN photonic integrated circuits.

Owing to its strong electro-optic coefficient and wide transparency window, lithium niobate (LN) has become an attractive photonic material. Thin-film lithium niobate (TFLN) technology has enabled tight mode confinement and high nonlinear efficiency. Various compact integrated photonics devices have been realized on the TFLN platform, such as compact high-performance modulators, polarization management devices, and broadband frequency comb sources. However, the inherent difficulty of

lithium niobate in realizing light sources and photodetector poses a challenge for the TFLN integrated photonics platform. As an essential optoelectronic component, an on-chip integrated high-performance photodetector is vital for TFLN photonic integrated chips.

In a new paper published in *Light: Advanced Manufacturing*, a research team, led by Professor Xiaojun Xie and Lianshan Yan from Key Laboratory of Photonic-Electric Integration and Communication-Sensing Convergence, School of Information Science and Technology, Southwest Jiaotong University, China, has reported a high-speed and high-responsivity modified uni-traveling carrier photodiodes heterogeneously integrated on the TFLN platform. The device exhibits a 3-dB bandwidth of 110 GHz and a responsivity of 0.4 A/W at a wavelength of 1,550-nm wavelength.

The fabrication process was initialized by the dry etching of LN waveguides and passive devices. A hybrid etching approach was followed to form device mesa. After metal plating and lift-off, the chips were diced and polished. Epitaxial layer structure, LN waveguide geometry, and CPW pad geometry were optimized to achieve both large bandwidth and high responsivity. To further assess the performance of the devices, the team applied these devices to a data transmission system and successfully detected PAM4 signals at 32 Gbaud with high quality. It was demonstrated that the heterogeneously integrated photodiodes on the TFLN platform have the potential to be applied in the next-generation high-speed transmission systems.

This work paves the way to achieving massive-scale, multi-function, and high-performance TFLN photonic integrated circuits. Moreover, it holds promise for ultra-high-speed optical communications, high-performance integrated microwave photonics, and multi-function integrated quantum photonics

Additional information

Funder

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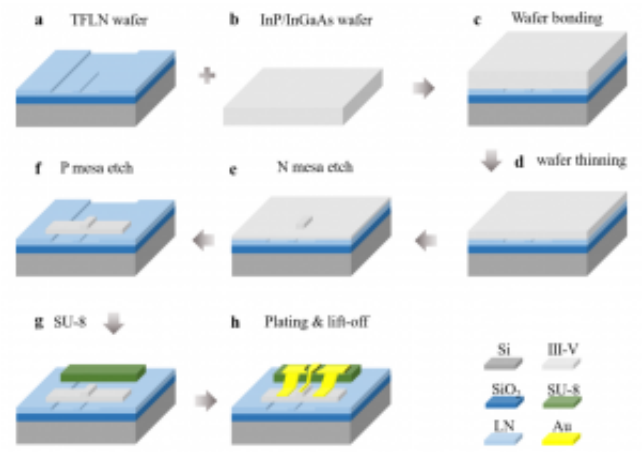

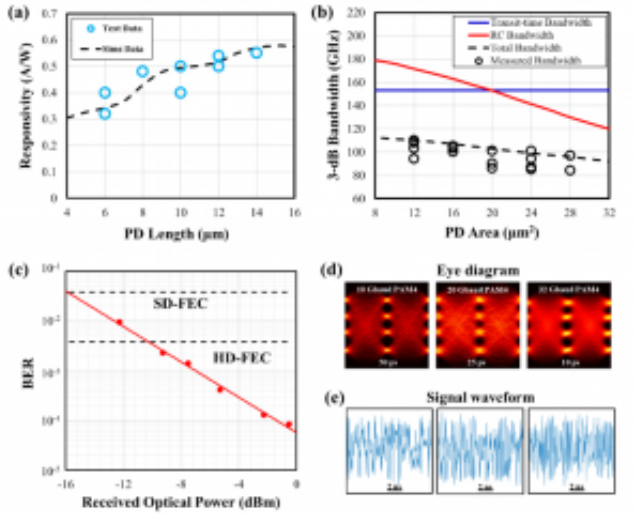

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