Editor's Focus

An erbium-doped lithium niobate micro-cavity laser

Lithium niobate is a popular material in the field of optical research, owing to its excellent physical properties such as nonlinearity, electro-optic and acousto-optic properties, piezoelectricity and photoelasticity. Along with the great progress in lithium niobate on insulator (LNOI), lithium niobate has raised a growing interest in the field of integrated optoelectronics in recent years [1], enabling the development of a wide range of integrated optoelectronic devices with excellent performance on LNOI, including frequency doublers, modulators and filters.

For a complete lithium niobate optoelectronic integrated chip, its on-chip communication band light source is an indispensable part. Besides, a communication-band light source is crucial to quantum communication [2], quantum key distribution [3] and the test of quantum mechanics fundamentals [4]. The development of lasers on LNOI is therefore in urgent need. As we all know, the rare-earth erbium ion energy level system meets the conditions for laser radiation in a communication band. Thus an on-chip integrated lithium niobate micro-laser is anticipated via doping lithium niobate with erbium ions, combining the whispering gallery mode micro-disk cavity with a small size and high-quality factor, and choosing a suitable pump source.

Liu et al. [5] from Shanghai Jiao Tong University have recently fabricated an on-chip micro-cavity laser using high-quality factor micro-disk resonators on erbium-doped LNOI. They used solid-state lasers in the 980 and 1460 nm band as pump sources and achieved high-efficiency laser outputs at 1530 and 1560 nm in the communication band.

Soon after Liu et al.'s submission being accepted by *Science China-Physics, Mechanics & Astronomy* (SCPMA), Luo et al. [6] from Nankai University reported an independent work on-chip micro-cavity laser using high-quality factor micro-disk resonators on erbium-doped LNOI, which has also been accepted by SCPMA.

These two reports on on-chip lithium niobate micro-lasers mark a significant step towards the integration of light sources and various functional devices on one chip.

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