III-nitride on silicon nanophotonic platform: electrical injection and microlaser photonic circuits

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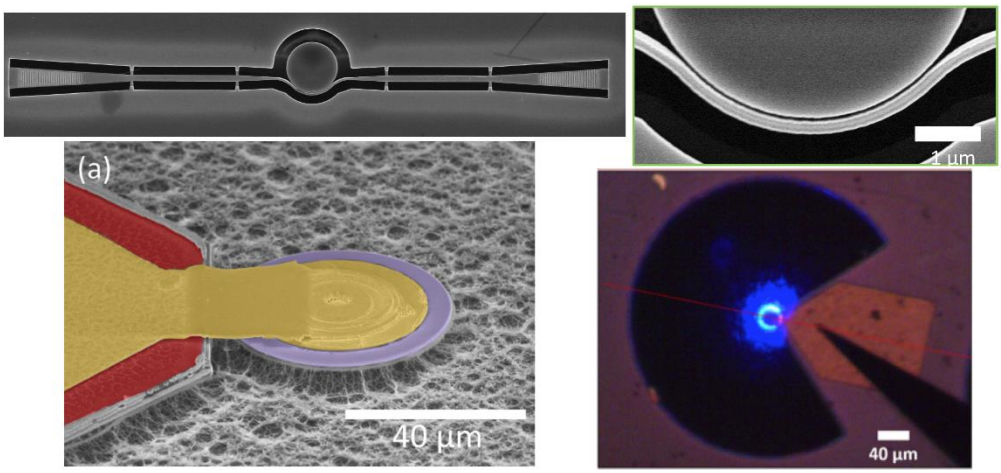

***Top**: A III-nitride photonic circuit combining a microdisk resonator with bus waveguides for light collection and outcoupling gratings. The distance between the microdisk and the bus waveguide is in the tens of nm range.*

***Bottom:** A III-nitride microring resonator with electrical injection. Electroluminescence is shown at the bottom right.*

A novel photonic plateform on Silicon enabled by III-Nitride Semiconductors

The group III-nitrides on silicon platform is promising for photonics as it is the only one that can simultaneously combine passive and active circuits operating in the UV and visible spectral range with monolithically integrated active emitters like lasers and LEDs.

Combining microdisk lasers under electrical injection with passive devices represents a major challenge in realizing a viable III-nitride nanophotonic platform on silicon. We have demonstrated two major achievements that will strengthen the viability of the III-nitride photonics platform on silicon.

We have successfully fabricated suspended active III-N photonic circuits containing a microdisk laser, a bus waveguide with a gap size as small as 80 nm and terminated on both sides by out-coupling gratings (See reference).

We have demonstrated electroluminescence from suspended microrings on silicon. The developed process enables to bypass the insulating AlN buffer layers and to inject current from the sample backside. The next step will be the coupling of a monolithic blue microdisk laser emitter with a full photonic circuitry on silicon.

Breakthroughs

Photonic circuit with suspended III-nitride on silicon Microdisk laser emission collected by bus waveguide Electrical injection in microring resonators

Perspectives

Microlasers on silicon under electrical injection.

Full photonic circuit with microlasers driven by electrical injection

Collaborations : C2N, CEA-INAC, L2C

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