Abstract Submitted
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Direct-bandgap infrared light emission from tensilely strained germanium nanomembranes[1] JOSE SÁNCHEZ-PÉREZ, University of Wisconsin Madison, CICEK BOZTUG, Boston University, FENG CHEN[2], University of Wisconsin Madison, FAISAL SUDRADJAT, Boston University, DEBORAH PASKIEWICZ, R.B. JACOBSON, University of Wisconsin Madison, ROBERTO PAIELLA, Boston University, MAX LAGALLY, University of Wisconsin Madison — Silicon, germanium, and related alloys, which provide the leading materials platform of electronics, are extremely inefficient light emitters because of their indirect fundamental energy bandgap. This basic materials property has so far hindered the development of group-IV photonic active devices, including diode lasers, thereby significantly limiting our ability to integrate electronic and photonic functionalities at the chip level. We show that Ge nanomembranes can be used to overcome this materials limitation. Theoretical studies have predicted that tensile strain in Ge lowers the direct energy bandgap relative to the indirect one. We demonstrate [1] that mechanically stressed nanomembranes allow for the introduction of sufficient biaxial tensile strain to transform Ge into a direct-bandgap, efficient light-emitting material that can support population inversion and therefore provide optical gain.

[1] J. R. Sánchez-Pérez, C. Boztug, F. Chen, F. Sudradjat, D. M. Paskiewicz, RB. Jacobson, M. G. Lagally, and R. Paiella, PNAS web published Nov, 14, 2011

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