平成 30 年 6 月 1 日

応用物理学会北海道支部
会員　各位

応用物理学会北海道支部
講演会のお知らせ

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演題：Recent Progress on Semiconductor Nanolasers
講師：Cun-Zheng Ning　（清華大学、アリゾナ州立大学　教授）
日時：平成３０年７月１８日（水）　13:30－15:00
場所：北海道大学量子集積エレクトロニクス研究センター3 階セミナー室(3-06)
主催：応用物理学会北海道支部

講演の要旨

This talk will discuss recent progress on semiconductor nanolasers. After some general introduction, the talk will cover three types of nanolasers: 1) nanolasers based on plasmonic structures or metallic cavities integrated with conventional III-V wafer structures; 2) nanolasers based on semiconductor nanowire or nanosheet structures grown using metal-catalyzed CVD; and 3) nanocavities integrated with two-dimensional (2D) monolayer of transition metal dichalcogenides (TMCs).
In the first part, the focus is to demonstrate semiconductor lasers with sizes smaller than diffraction limit for potential applications in integrated photonic system on chips. After the review of past progress, we will present some of our recent work on nano-membrane lasers and on plasmonic nano-disk lasers. The second nanolasers use nanostructures grown using the bottom-up approach, where the focus is to demonstrate multi-color lasers on a single chip or from a single monolithic piece of semiconductors. Such lasers include simultaneous lasing in red and green, or even RGB lasing to produce white light sources with laser properties, or so called white lasers. The third nanolasers will deal with the most recent progress in integrating the thinnest gain medium, the 2D monolayer TMCs, with nanolaser cavities. Integration of such monolayer with a silicon nanobeam cavity has resulted in our recent demonstration of room temperature lasing based on a single layer of TMCs, because of strong excitonic emission and high optical gain. Such silicon compatible lasers might provide an important alternative for high energy-efficiency applications in silicon integrated photonics.

Related References

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4. C.Z. Ning, L.T. Dou, and P.D. Yang, Nanoscale Bandgap Engineering: Semiconductor Alloy Nanomaterials with Widely Tunable Compositions, Nature Review Materials, 2, 17070 (2017)
5. Y.Z. Li et al., Room-temperature Continuous-wave Lasing from Monolayer Molybdenum Ditelluride with a Silicon Nanobeam Cavity, Nat. Nanotech., 12, 987 (2017)
6. F. Fan, S. Turkdogan, Z. Liu, D. Shelhammer, C.Z. Ning, A monolithic white laser, Nat. Nanotech., 10, 796 (2015)

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