Ya-Qing Bie
Gabriele Grosso, Mikkel Heuck, Marco M. Furchi, Yuan Cao, Jiabao Zheng, Darius Bunandar, Efren Navarro-Moratalla, Lin Zhou, Dmitri K. Efetov, Takashi Taniguchi,Kenji Watanabe, Jing Kong, Dirk Englund, Pablo Jarillo-Herrero
Massachusetts Institute of Technology, 77 Massachusetts Ave, Cambridge, U.S.

yqbie@mit.edu

A $MoTe_2$ LED and photodetector for silicon photonics

One of the current challenges in photonics is developing high-speed, power-efficient, chip-integrated optical communications devices to address the interconnects bottleneck in high-speed computing systems. Silicon photonics has emerged as a leading architecture, in part because of the promise that many components, such as waveguides, couplers, interferometers and modulators, could be directly integrated on silicon-based processors. However, light sources and photodetectors present ongoing challenges. Common approaches for light sources include one or few off-chip or wafer-bonded lasers based on III–V materials, but recent system architecture studies show advantages for the use of many directly modulated light sources positioned at the transmitter location. The most advanced photodetectors in the silicon photonic process are based on germanium, but this requires additional germanium growth, which increases the system cost. The emerging two dimensional transition-metal dichalcogenides (TMDs) offer a path for optical interconnect components that can be integrated with silicon photonics and complementary metal-oxidesemiconductors(CMOS) processing by back-end-of-the-line. In this talk, I will show that one type of 2D layered material, molybdenum ditelluride ($MoTe_2$) could bring us one-step closer to chip-integrated devices based on silicon photonics architectures by acting as an active light source or bias-free high speed photodetectors[1].

References

[1] Ya-Qing Bie et al, Nature Nanotechnology, 12 (2017) 1124–1129.

Figures

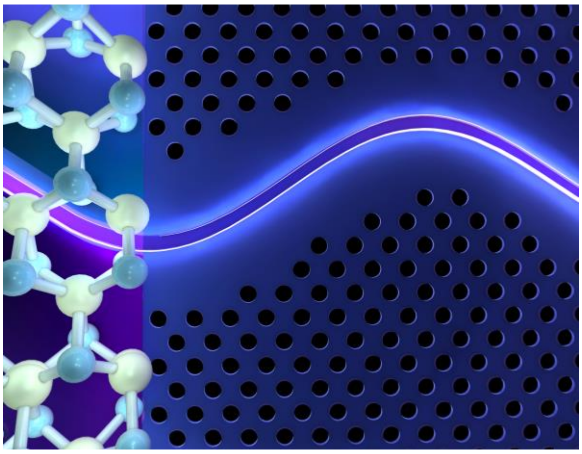

Figure 1: A molybdenum ditelluride light source for silicon photonics