

# 2D Materials Optoelectronic Devices for Quantum Information Processing and Sensing

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There has been great experimental progress towards a range of emerging quantum technologies, but new device concepts are needed to achieve the required quantum control of light and matter. Recent work shows that different types of 2D materials can be assembled into entirely new types of 2D heterostructures, enabling optoelectronic properties that were impossible using bulk semiconductors. These atomically engineerable heterostructures hold particular promise for quantum technologies. Here, we review our recent work in two application areas. The first part of the talk focuses on chip-integrated graphene photodetectors. Depending on the different photodetection processes available in graphene, waveguide-integrated detectors can attain high response speed and responsivity [1], and they also promise single-photon resolution across a broad optical spectrum[2]. The second part of the talk focuses on light sources, including spectrally tunable thermal[3] and spectrally tunable single-photon sources[4,5]

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## References

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