

• Supplementary File •

Supplementary Information: Mid-infrared plasmonic silicon quantum dot/HgCdTe photodetector with ultrahigh specific detectivity

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Appendix A Supplementary Note 1. Extraction of response time

The rise and fall time were extracted by the curve fitting according to Eqs. (A1), (A2), respectively. Equation for fitting the rise process of photoresponse can be expressed as

$$y = A_1 e^{t/\tau_{rise}} + y_0, \quad (\text{A1})$$

and for the fall it can be expressed as

$$y = A_1 e^{-t/\tau_{fall}} + y_0, \quad (\text{A2})$$

Where τ_{rise} and τ_{fall} are the rise and fall constants.

Appendix B Supplementary Note 2. Band gap calculations of MCT.

The bandgap of $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ can be obtained by the formula proposed by Hansen [1]:

$$E_g = -0.302 + 1.93x - 0.81x^2 + 5.35 \times 10^{-4}(1 - 2x)T, \quad (\text{B1})$$

Where x is a component of $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$, and T is the test temperature of MCT. According to the calculation, the band gap of $\text{Hg}_{0.74}\text{Cd}_{0.26}\text{Te}$ is 0.237 eV at 300 K and 0.179 eV at 77 K.

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† Cui Y Y and Tong Z Y have the same contribution to this work.

Appendix C Supplementary Figures

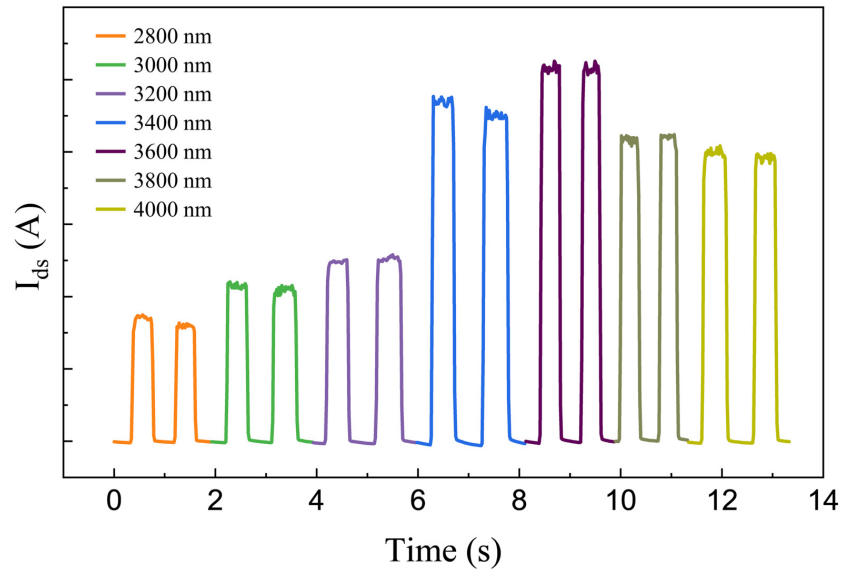


Figure C1 Drain source current of the B-doped Si-QD/MCT photodetector under different laser wavelength.

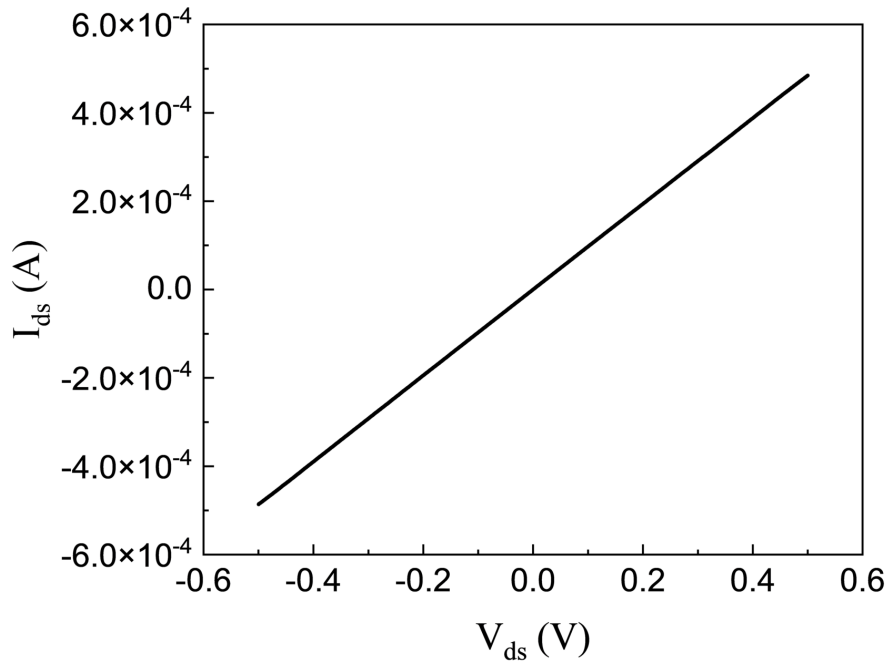


Figure C2 The I-V curve of the B-doped Si-QD/MCT photodetector under dark condition.

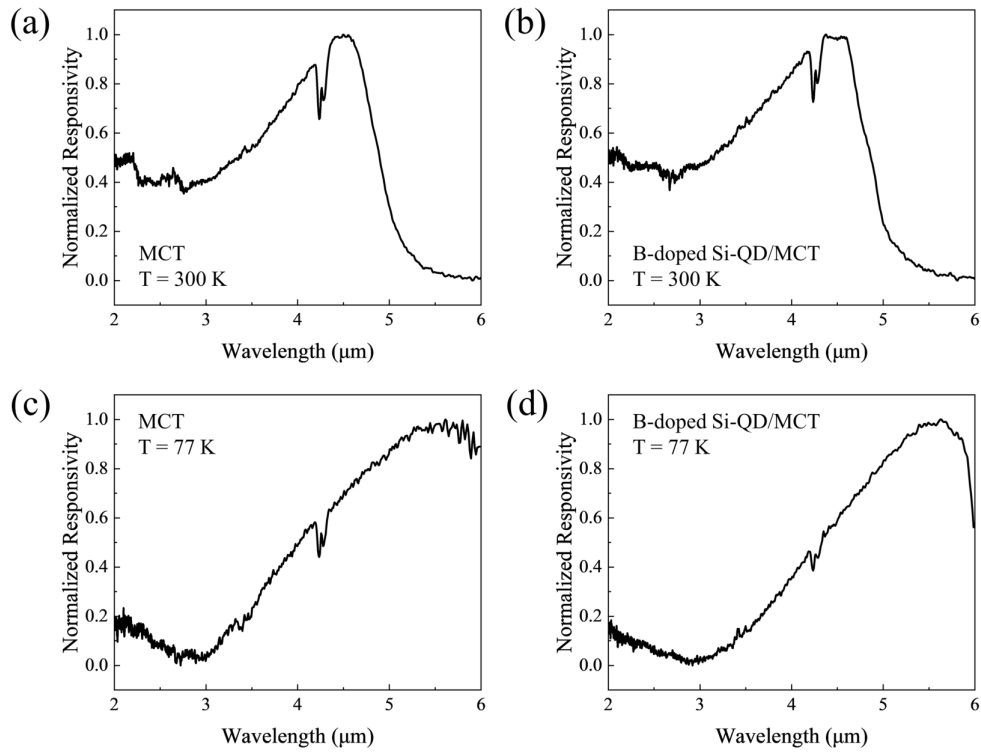


Figure C3 The normalized FTIR relative response spectrum. (a, b) Normalized responsivity of MCT and B-doped Si-QD/MCT photodetector at different wavelengths under 300 K. (c, d) Normalized responsivity of MCT and B-doped Si-QD/MCT photodetector at different wavelengths under 77 K.

References

- 1 Hansen G L, Schmit J L, Casselman T N, Energy-Gap Versus Alloy Composition and Temperature in $Hg_{1-x}Cd_xTe$. J Appl Phys, 1982, 53: 7099-7101.