亮点报道：1T'-$MoTe_2$/2H-$MoTe_2$ 范德华异质结构的高灵敏多波段红外偏振光电探测器

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同一种化学物质，其原子可以排列成不同的晶体结构 (称为“相”)，从而拥有截然不同的性质。其中，1T'相的 $MoTe_2$ 是一种拓扑半金属，对红外光有很好的响应潜力，且其扭曲的晶体结构天然具有各向异性，适合偏振探测。而将其与半导体特性的 2H 相 $MoTe_2$ 结合，构建成范德华异质结，有望优势互补，创造出高性能且结构简单的探测核心。

北京信息科技大学祝连庆教授研究团队聚焦于开发新型近红外偏振光电探测器，其核心创新在于巧妙地利用了同一种化学物质——$MoTe_2$ 的两种不同原子排列形式。通过将半导体特性的 2H 相与半金属特性的 1T'相像积木一样垂直堆叠，构建出一种全二维范德华异质结。这种独特的“同质多晶异质结”设计，无需复杂的外部光学元件，其本身即可实现对光偏振方向的高灵敏度识别。开发的探测器成功实现了从可见光到近红外的成像验证。

该研究为未来开发超薄、超集成、高性能的“片上智能视觉系统”奠定了坚实的基础，预示着光电探测与成像技术将朝着更智能、更紧凑的方向迈进。

Highlights: Ultra-sensitive multi-band infrared polarization photodetector based on 1T'-$MoTe_2$/2H-$MoTe_2$ van der Waals heterostructure

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Near-infrared polarized photodetectors hold significant importance for applications in remote sensing, imaging, and optical communications. Van der Waals heterostructures built from two-dimensional transition metal dichalcogenides represent a vital platform for developing next-generation optoelectronic devices.

Professor Lianqing Zhu's team from Beijing Information Science and Technology University presents a high-performance near-infrared polarized photodetector based on a 1T'-$MoTe_2$/2H-$MoTe_2$ homologous polymorphic van der Waals heterojunction. The fabricated photodetector exhibits outstanding performance across a broad optical spectrum, spanning from 532 nm (visible) to 2200 nm (short-wave infrared). Under illumination by a 1310 nm near-infrared laser, the device demonstrates a high responsivity of 3.06 $A\cdot W^{-1}$, a specific detectivity of 3.2×10^9 Jones, and an exceptional external quantum efficiency of 289%. These metrics highlight its superior sensitivity in converting light into electrical signal.

In summary, this research is important because it pioneers a fundamental materials science approach—constructing high-performance heterojunctions from different phases of a single material.

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