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Special Issue Reprint

Semiconductor Infrared Devices and Applications

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Infrared (IR) technologies—from Herschel's initial experiment in the 1800s to thermal detector development in the 1900s, followed by defense-focused developments using HgCdTe—have now incorporated a myriad of novel materials for a wide variety of applications in numerous high-impact fields. These include astronomy applications; composition identifications; toxic gas and explosive detection; medical diagnostics; and industrial, commercial, imaging, and security applications. Various types of semiconductor-based (including quantum well, dot, ring, wire, dot in well, hetero and/or homo junction, Type II super lattice, and Schottky) IR (photon) detectors, based on various materials (type IV, III-V, and II-VI), have been developed to satisfy these needs. Currently, room temperature detectors operating over a wide wavelength range from near IR to terahertz are available in various forms, including focal plane array cameras. Recent advances include performance enhancements by using surface Plasmon and ultrafast, high-sensitivity 2D materials for infrared sensing. Specialized detectors with features such as multiband, selectable wavelength, polarization sensitive, high operating temperature, and high performance (including but not limited to very low dark currents) are also being developed.

This Special Issue highlights advances in these various types of infrared detectors based on various material systems.

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