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NEWSBREAKS

Indium phosphide-based photodetectors sense longer wavelengths

Researchers at Northwestern University (Evanston, IL) and Wright Patterson Air Force Base (Ohio) have demonstrated quantum-well infrared photodetectors (QWIPs) for wavelengths between 8 and 20 μm using lattice-matched indium gallium aluminum arsenide-indium phosphide (InGaAlAs-InP). Three device structures were grown using gas-source molecular-beam epitaxy (MBE). Group-V MBE sources were arsine and phosphine, group III sources were elemental gallium and indium, and the n-type dopant source was elemental silicon. The aluminum arsenide mole fraction and quantum-well width were, respectively, 0 and 56 Å in the first structure, 0.1 and 60 Å in the second, and 0.15 and 65 Å in the third. The corresponding spectral response peak and cutoff wavelengths were 8.1 and 8.5 μm in the first structure, 12.7 and 13.3 μm in the second and 19 and 19.5 μm in the third. Full-width-at-half-maximum linewidths for the spectral response curves were 12.5%, 8%, and 9%, respectively.

While QWIPs based on AlGaAs-GaAs for wavelengths from 8 to12 μm have reached commercial maturity, QWIPs based on lattice-matched InP substrates offer advantages, say the researchers. These include the possibility of growing a two-color detector stack based on lattice-matching between the InP-based long-wavelength QWIP and an InP-based mid-wavelength (3 to 5 μm) QWIP that operates below the achievable wavelength range in the AlGaAs-GaAs material system.

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