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Effect of doping on performance of IR quantum dot photodetector GUILLAUME THOMAIN, VLADIMIR MITIN, VICTOR POGREBNYAK, ANDREI SERGEEV, University at Buffalo — We investigated the influence of the dopant position and dopant concentration on performance of InAs/$Al_{.22}Ga_{.78}As$ quantum dot infrared photodetectors. We designed and fabricated three types of the QDIP with a InAs-dot sheet concentration of $1.04x10^{11}$ cm^{-2}, which differ only in the position and density of a Si-dopant. In the first one, the dopant with a density of $5.4x10^{11}cm^{-2}$ was placed directly into the QD layer; in the second, the same amount of the dopant was placed in the middle of the $Al_{.22}Ga_{.78}As$ spacer between the QD layer in such a way that it was sandwich between the two undoped $Al_{.22}Ga_{.78}As$ layers facing QD layers on both sides; in the third type, position of the dopant was the same as in the second device, but its concentration was 1.5 greater. The spectral, electrical, and temperature characterization of these devices demonstrated that device 3 had the largest responsivity and detectivity at 3.7 μm comparable with the best quantum well and MCT detectors. The experimental characterization along with simulations allowed us to analyze and explained the enhanced photoresponse of device 3.

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