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Современное состояние разработок и исследований сверхрешеток II типа для приборов ИК-фотоэлектроники (обзор)

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Рассмотрены основные свойства композиционных сверхрешеток II типа (T2SL). Приведено описание различных типов гетеропереходов, энергетических условий их реализации, а также представлены результаты теоретических и экспериментальных исследований оптических и электрических свойств T2SL на основе InAs/GaSb, InAs/GaInSb и InAs/InAsSb. По результатам качественного анализа и оценки характеристик сверхрешеток II типа относительно классических полупроводниковых соединений, используемых в ИК-фотоэлектронике (HgCdTe, InSb и QWIP-структур), выявлены и описаны преимущества и недостатки T2SL. Проведено сравнение сверхрешеток II типа на основе InAs/GaSb, InAs/GaInSb и InAs/InAsSb, по результатам которого показаны перспективы применения T2SL в технологии изготовления современных и перспективных фотоприемников и фотоприемных устройств ИК-диапазона.

Ключевые слова: сверхрешетки II типа, сверхрешетки InAs/GaSb, сверхрешетки InAs/GaInSb, сверхрешетки InAs/InAsSb, ИК ФПУ, ИК фотодетектор.

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The current state of the development and research of type II superlattices for infrared photodetective devices (a review)

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The main properties of type II superlattices (T2SL) are considered. The description of various heterojunction types and energy conditions of their realization is given. The results of theoretical and experimental studies of optical and electrical properties of T2SLs based on InAs/GaSb, InAs/GaInSb and InAs/InAsSb are presented. Based on the results of qualitative analysis and evaluation of the characteristics of T2SL relative to classical semiconductor compounds used in infrared photoelectronics (HgCdTe, InSb and QWIP structures), the advantages and disadvantages of T2SL are identified and described. A comparison of type II superlattices based on InAs/GaSb, InAs/GaInSb and InAs/InAsSb was carried out, the results of which showed the prospects of T2SL applications in the manufacturing state-of-art and promising infrared photodetectors.

Keywords: type II superlattices, InAs/GaSb superlattices, InAs/GaInSb superlattices, InAs/InAsSb superlattices, IR photodetector, IR FPA.

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