

Characteristics of GaAs/InGaP and AlGaAs/GaAs/InAlGaP Npn Heterostructural Optoelectronic Switches

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Abstract : Optoelectronic switches have attracted a considerable attention in the semiconductor research field due to their potential applications in optical computing systems and optoelectronic integrated circuits (OEICs). With high gains and high-speed operations, npn heterostructures can be used to produce promising optoelectronic switches. It is known that the bulk barrier and heterostructure-induced potential spike act important roles in the characteristics of the npn heterostructures. To investigate the effects of bulk barrier and potential spike heights on the optoelectronic switching of the npn heterostructures, GaAs/InGaP and AlGaAs/GaAs/InAlGaP npn heterostructural optoelectronic switches (HSOSs) have been fabricated in this work. It is seen that the illumination decreases the switching voltage V_s and increases the switching current I_s , and thus the OFF state is under dark and ON state under illumination in the optical switching of the GaAs/InGaP HSOS characteristics. But in the AlGaAs/GaAs/InAlGaP HSOS characteristics, the V_s and I_s present contrary trends, and the OFF state is under illumination and ON state under dark. The studied HSOSs show quite different switching variations with incident light, which are mainly attributed to the bulk barrier and potential spike heights affected by photogenerated carriers.

Keywords : bulk barrier, heterostructure, optoelectronic switch, potential spike

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