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标题: Temperature dependent energy relaxation time in AlGaN/AlN/GaN heterostructures
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摘要: The two-dimensional (2D) electron energy relaxation in Al0.25Ga0.75N/AlN/GaN heterostructures was investigated experimentally by using two experimental techniques; Shubnikov-de Haas (SdH) effect and classical Hall Effect. The electron temperature (T-e) of hot electrons was obtained from the lattice temperature (T-L) and the applied electric field dependencies of the amplitude of SdH oscillations and Hall mobility. The experimental results for the electron temperature dependence of power loss are also compared with the current theoretical models for power loss in 2D semiconductors. The power loss that was determined from the SdH measurements indicates that the energy relaxation of electrons is due to acoustic phonon emission via unscreened piezoelectric interaction. In addition, the power loss from the electrons obtained from Hall mobility for electron temperatures in the range T-e > 100 K is associated with optical phonon emission. The temperature dependent energy relaxation time in Al0.25Ga0.75N/AlN/GaN heterostructures that was determined from the power loss data indicates that hot electrons relax spontaneously with MHz to THz emission with increasing temperatures. 
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