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Abstract

The J-V characteristic of a-SiN:H P-I-N TFLED was studied. It is found that when applied bias voltage less than threshold voltage, current densities of reverse and forward bias are almost equal. This properties will happen only when the current is limited by the I-layer which has the highest resistance. In order to study current-conduction mechanism in the I-layer, numerical approximation in one dimension is used for calculating interested quantities such as potential, electric field and carrier concentration etc. Anomalous Poole-Frenkel emission is the best theory that give calculated result which agrees with experimental result [1]. When energy gap of the I-layers equal to 2.50 eV and 2.90 eV Fermi-energies are 0.735 eV and 0.883 eV respectively below the minimum of conduction band. Electron impact ionization is primary cause of light emission in the I-layer of P-I-N TFLED. Current density was calculated by setting appropriate initial condition of ionization. Constant generation rate and radiative recombination rate depend on magnitude of electric field in the I-layer. The relation of generation rate and radiative recombination rate with electric field were analyzed. It is found that ionization coefficient of electron in a-SiN:H film is higher than ionization coefficient of electron in silicon crystal. We also found that the life time of hole increases as the magnitude of electric field increases and begin to be constant when electric field is higher than 1.45 mV/cm.