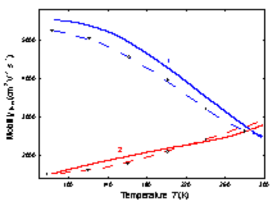
GaSb - Gallium Antimonide

Electrical properties

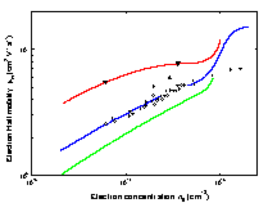
Basic Parameters

Breakdown field	$\approx 5\cdot 10^4$
Mobility electrons	≤ 3000 cm^2 V^{-1} s^{-1}
Mobility holes	≤ 1000 cm^2 V^{-1} s^{-1}
Diffusion coefficient electrons	≤ 75 cm^2/s
Diffusion coefficient holes	≤ 25 cm^2/s
Electron thermal velocity	$5.8\cdot 10^5$ m/s
Hole thermal velocity	$2.1\cdot 10^5$ m/s

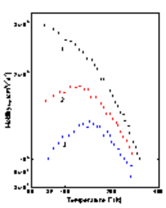
Mobility and Hall Effect



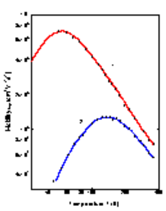
Electron Hall mobility versus temperature for different doping levels.
1. $N_d = 1.7\cdot 10^{18}$ cm^{-3}
2. $N_d = 2.8\cdot 10^{17}$ cm^{-3}
Broken curves represent the experimental data. Continuous curves represent theoretical calculations.
(Mathur and Jain (1979)).



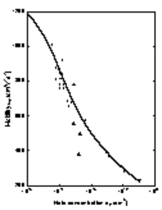
Electron Hall mobility versus electron concentration n_o. T=77 K.
Open circles represent measurements with a group of samples having approximately the same residual acceptor concentrations N_a. Full symbols:specimens with lower residual acceptor concentrations. Solid lines represent the theoretical calculations for different values of compensating acceptor densities - either singly (N_a^-) or doubly (N_a^{--}) ionized.
1. $N_a^- = 1.2\cdot 10^{17}$ or $N_a^{--} = 0.4\cdot 10^{17}$ cm^{-3}
2. $N_a^- = 2.85\cdot 10^{17}$ or $N_a^{--} = 0.95\cdot 10^{17}$ cm^{-3}
3. $N_a^- = 4.5\cdot 10^{17}$ or $N_a^{--} = 1.5\cdot 10^{17}$ cm^{-3}
(Baxter et al. (1967)).



Hole Hall mobility versus temperature at different compensation levels.
1. $N_a = 1.39\cdot 10^{17}$ cm^{-3}; $N_d = 9\cdot 10^{15}$ cm^{-3};
2. $N_a = 1.3\cdot 10^{17}$ cm^{-3}; $N_d = 9.5\cdot 10^{16}$ cm^{-3};
3. $N_a = 1.1\cdot 10^{17}$ cm^{-3}; $N_d = 9.5\cdot 10^{16}$ cm^{-3}
(Nakashima (1981)).

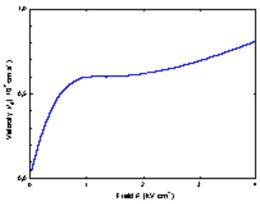


Temperature dependence of hole Hall mobility.
MBE technique. Hole concentration at 300 K:
1. - $2.28\cdot 10^{16}$ cm^{-3};
2. - $1.9\cdot 10^{19}$ cm^{-3}.
(Johnson et al. (1988)).

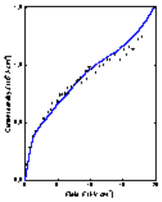


The hole Hall mobility versus hole concentration, 300 K.
Experimental data are taken from five different papers *(Wiley (1975))*.

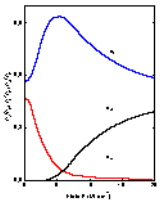
Transport Properties in High Electric Fields



Calculated field dependence of the electron drift velocity, 300 K.
(Ikoma et al. (1980)).

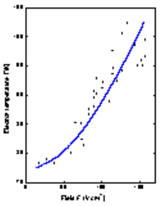


Calculated (solid) end experimental (points) current density dependencies versus the electric field, 300 K.
(Jantsch and Heinrich (1971)).



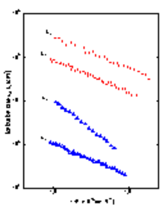
Fraction of electrons in Γ, L, X valleys as a function of electric field,300 K

n=6.8·10^{16} cm^{-3}
(Jantsch and Heinrich (1971)).

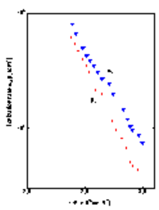


Electron temperature as a function of the electric field, T=77 K.
full and open circle - experimental data
curve are calculated *(Jantsch and Heinrich (1971))*.

Impact Ionization

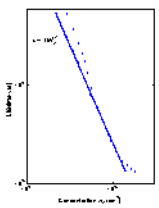


The dependences of α_i and β_i> versus 1/F. T=77 K
Open symbols : F (111).
Filled symbols : F (100).
(Zhingarev et al. (1981)).

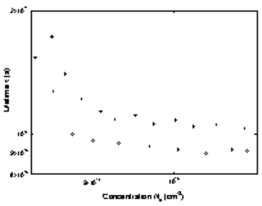


The dependences of α_i and β_i versus 1/F). T=300 K
F (100).
(Hildebrand et al. (1980)).

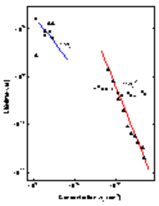
Recombination Parameters



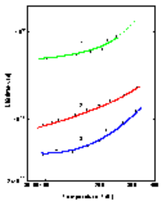
Radiative lifetime versus donor concentration, T =77 K, GaSb(Te).
To extract these dependences from experimental data the values of internal quantum efficiency η were taken:
open circles η=0.8;
filled circles η=1;
(Agaev et al. (1984)).



Nonradiative lifetime versus donor concentrations, *T* =77K, GaSb(Te).
open circles η= 0.8;
filled circles η= 1; (Agaev *et al*. [1984]).



Electron radiative (triangles) and nonradiative (squares) lifetime versus acceptor concentration, *p*-GaSb, T=77 K.
(Titkov et al. (1986)).



Electron lifetime versus temperature at different acceptor concentrations.
N_a (cm^{-3}): **1**. $5 \cdot 10^{18}$; **2**. $2.2 \cdot 10^{19}$; **3**. $3.5 \cdot 10^{19}$.
(Titkov et al. (1986)).

Radiative recombination coefficient	~10^{-10} cm^3 s^{-1}
Auger coefficient	
77K	$2 \cdot 10^{-29}$ $cm^6 s^{-1}$
300 K	$5 \cdot 10^{-30}$ $cm^6 s^{-1}$