Ch/ChE 140a
Semiconductor Data Tables
KEEP THIS TABLE! YOU WILL NEED IT ON SEVERAL HOMEWORK SETS!

The following data is precise for undoped semiconductors at 300K.

↓ Physical Property \ Semiconductor →	Ge	Si	GaAs	CdS[†]	TiO_2[‡]
Bandgap (E_{gap}) [eV]	0.67	1.12	1.424	2.42	3.2
Gap Transition Type	Indirect	Indirect	Direct	Direct	Indirect
Electron Mobility (μ_e or μ_n) [cm^2/V-s]	3900	1500	8500	340	0.4
Hole Mobility (μ_h or μ_p) [cm^2/V-s]	1900	450	400	50	16
Effective Mass, longitudinal ($m_{e,l}/m_e$)	1.64	0.98	0.067	0.21	~10
Effective Mass, transverse ($m_{e,t}/m_e$)	0.082	0.19	-	-	-
Hole Effective Mass, light (m_{lh}/m_e)	0.04	0.16	0.082	0.80	~0.8
Hole Effective Mass, heavy (m_{hh}/m_e)	0.28	0.49	-	-	-
Relative Dielectric Constant ($\varepsilon_s/\varepsilon_o$ or κ) [unitless]	16.0	11.9	13.1	5.4	114
Electron Affinity (χ) [V]	4.0	4.05	4.07	4.5	
CB Effective Density of States (N_C) [cm^{-3}]	1.0×10^{19}	2.8×10^{19}	4.7×10^{17}	2×10^{18}	8×10^{20}
VB Effective Density of States (N_V) [cm^{-3}]	6.0×10^{18}	1.0×10^{19}	7.0×10^{18}	2×10^{19}	2×10^{19}
Mass Density (ρ_m) [g/cm^3]	5.3267	2.328	5.32	4.82	4.23
Atomic Density (ρ_a) [$atoms/cm^3$]	4.4×10^{22}	5.0×10^{22}	4.4×10^{22}	2×10^{22}	3.2×10^{22}
Crystal Structure	Diamond	Diamond	ZnBlende	Wurzite	Anatase
Breakdown Field (E_{crit}) [V/cm]	$\sim10^5$	$\sim3\times10^5$	$\sim4\times10^5$		$\sim6\times10^4$
Intrinsic Debye Length (L_D) [μm]	0.68	24	2250		
Intrinsic Resistivity [Ω-cm]	47	2.3×10^5	10^8		
Lattice Constant (a_o) [Å]	5.64613	5.43095	5.6533	a=4.16, c=6.756	

[†]CdS exists in two distinct crystal forms: hexagonal and cubic. The data given here refer to the hexagonal phase, the more stable of the two crystal forms.
[‡]TiO_2 exists in two distinct crystal forms, rutile and anatase. The data given here refer to the anatase phase in colloidal form, as it is most commonly used in semiconductor applications.

References Used in the Preparation of This Table:

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