Dopant Energy Levels

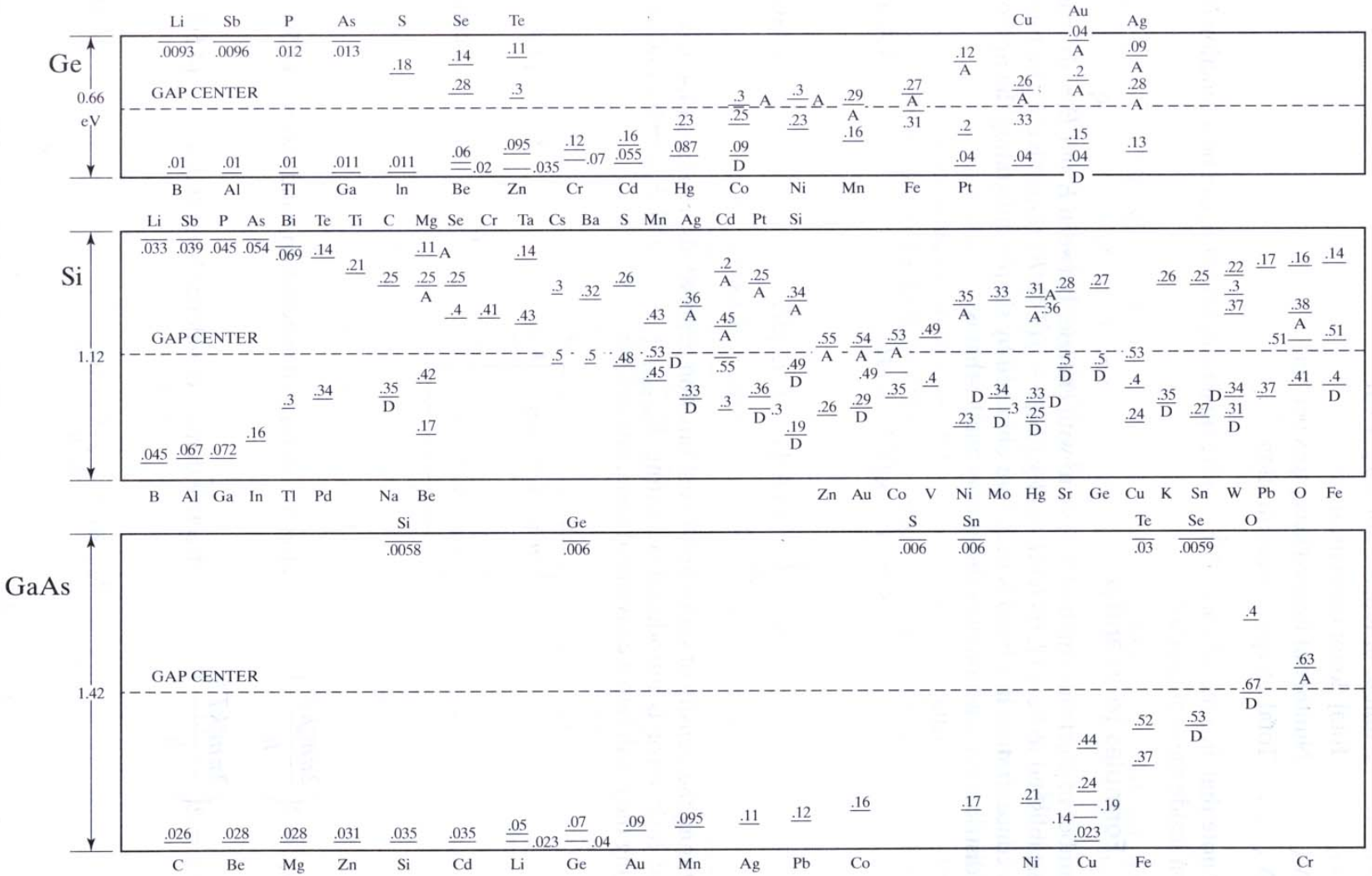

Figure 4.14 Measured ionization energies for the most commonly encountered impurities in Ge, Si, and GaAs. The levels above midgap are referenced to E_c and are donor-like or multiply charged donors, unless marked with an A which identifies an acceptor level. The levels below midgap are referenced to E_v and are acceptor-like or multiply charged acceptors, unless marked with a D for donor level. (From Sze.[3] Reprinted with permission.)

Pierret, *Advanced Semiconductor Fundamentals* (Pren. Hall, 2003).

Dopant Energy Levels

Table 5.1 Selected typical properties of Ge, Si and GaAs at 300 K. Effective mass related to conductivity (labeled a) is different than that for density of states (labeled b).

	E_g (eV)	χ (eV)	N_c (cm^{-3})	N_v (cm^{-3})	n_i (cm^{-3})	μ_e ($cm^2\ V^{-1}\ s^{-1}$)	μ_h ($cm^2\ V^{-1}\ s^{-1}$)	m_e^*/m_e	m_h^*/m_e	ε_r
Ge	0.66	4.13	1.04×10^{19}	6.0×10^{18}	2.4×10^{13}	3900	1900	0.12 a 0.56 b	0.23 a 0.40 b	16
Si	1.10	4.01	2.8×10^{19}	1.04×10^{19}	1.45×10^{10}	1350	450	0.26 a 1.08 b	0.38 a 0.56 b	11.9
GaAs	1.42	4.07	4.7×10^{17}	7×10^{18}	1.8×10^{6}	8500	400	0.067 a,b	0.40 a 0.50 b	13.1

Note: Effective mass related to conductivity (labeled a) is different for density of states (labeled b).
From *Principles of Electronic Materials and Devices, Second Edition*, S.O. Kasap (© McGraw-Hill, 2002)
http://Materials.Usask.Ca

Pierret, *Advanced Semiconductor Fundamentals* (Pren. Hall, 2003).