From *Semiconductor Physics and Devices: Basic Principles* (4th Edition), Donald A. Neamen, McGraw Hill, 2012, ISBN 978-0-07-352958-5.

For the Group IV elemental semiconductor Si (E_g = 1.12 eV) and Ge (E_g = 0.66 eV), we use Group III elements as acceptors and Group V elements as donors.

Table 4.3 | Impurity ionization energies in silicon and germanium

Impurity	Ionization energy (eV) Si	Ge
Donors		
Phosphorus	0.045	0.012
Arsenic	0.05	0.0127
Acceptors		
Boron	0.045	0.0104
Aluminum	0.06	0.0102

- Note that the ionization energies are indeed far smaller than the gap energies for silicon and germanium.

For a Group III-V semiconductor such as GaAs (E_g = 1.424 eV), we use Group II elements as acceptors and Group VI elements as donors.

Table 4.4 | Impurity ionization energies in gallium arsenide

Impurity	Ionization energy (eV)
Donors	
Selenium	0.0059
Tellurium	0.0058
Silicon	0.0058
Germanium	0.0061
Acceptors	
Beryllium	0.028
Zinc	0.0307
Cadmium	0.0347
Silicon	0.0345
Germanium	0.0404

- Note that the ionization energies are indeed far smaller than the gap energy for gallium arsenide.