Examples of semiconductor lattices

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Both group IV semiconductors, **germanium or Ge** and **silicon or Si, have** unit cube/cell(s) as shown below. They consist of two sublattices, each face centered cubic (fcc) that overlap in a structure called a diamond lattice.

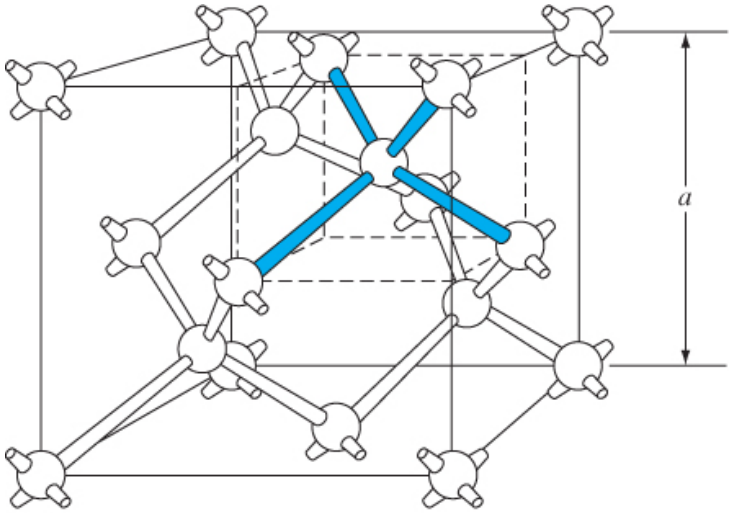

Figure 1.11 | The diamond structure.

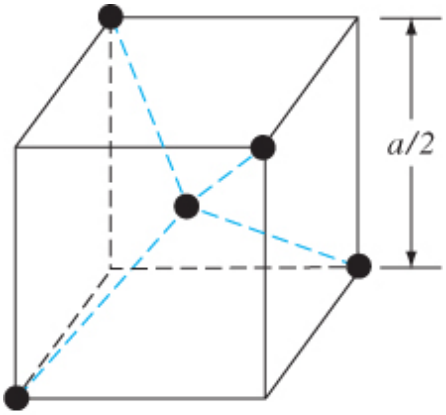

Figure 1.12 | The tetrahedral structure of closest neighbors in the diamond lattice.

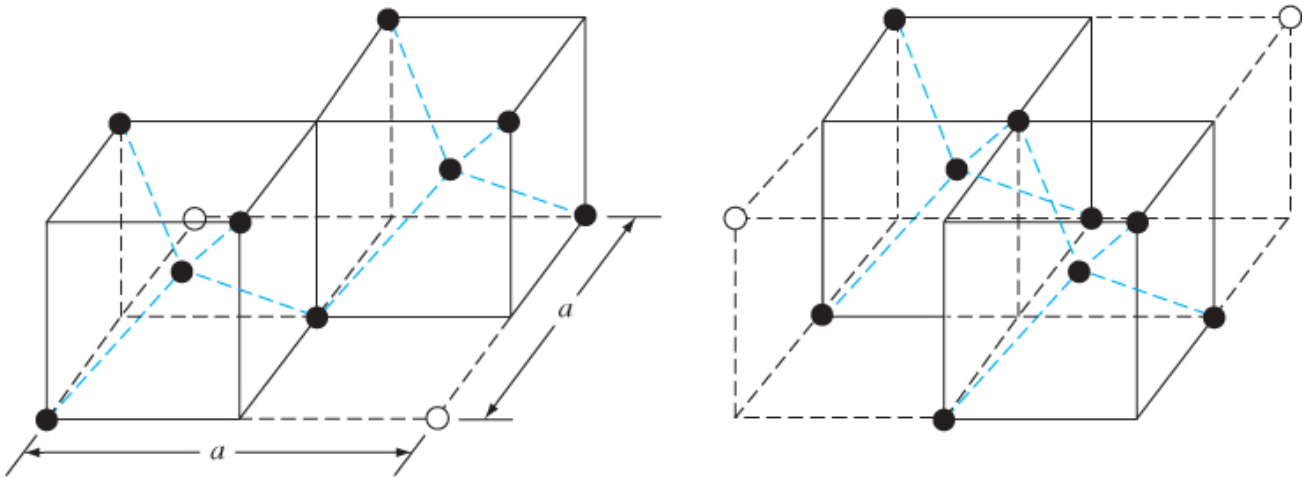

Figure 1.13 | Portions of the diamond lattice: (a) bottom half and (b) top half.

A **gallium arsenide or GaAs** unit cube/cell is shown below. It consists of two sublattices, each face centered cubic (fcc) and offset with respect to each other by half the diagonal of the fcc cube, a crystal configuration known as cubic sphalerite/sphalerite or zinc blende/zincblende. The key difference from the diamond lattice is that there are two different elements involved.

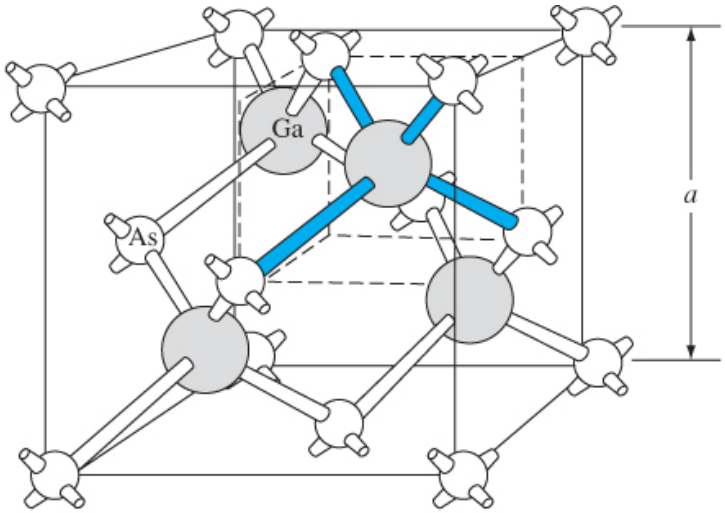

Figure 1.14 | The zincblende (sphalerite) lattice of GaAs.

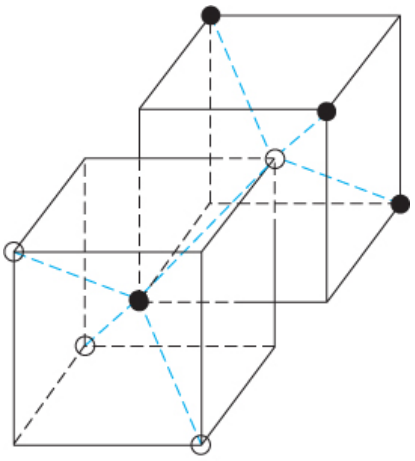

Figure 1.15 | The tetrahedral structure of closest neighbors in the zincblende lattice.