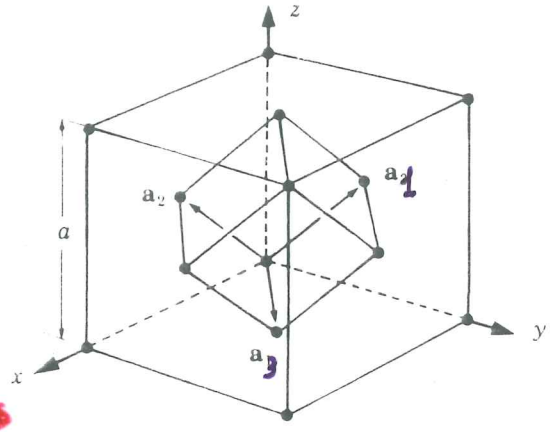


Reticolo di Bravais

Fig. 2.1. Face-centered cubic lattice. The rhombohedron constructed from the vectors $\mathbf{a}_1 = (a/2)(\mathbf{i}+\mathbf{j})$, $\mathbf{a}_2 = (a/2)(\mathbf{j}+\mathbf{k})$, $\mathbf{a}_3 = (a/2)(\mathbf{i}+\mathbf{k})$ forms the primitive cell.

a =

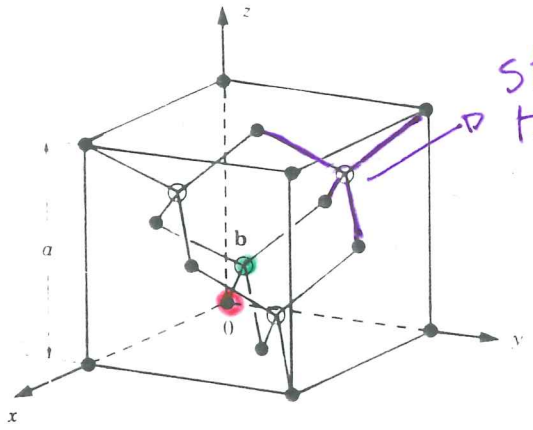
Si → 5.43 Å

Ge → 5.66 Å

GaAs → 5.65 Å

GaP → 5.45 Å

InP → 5.87 Å



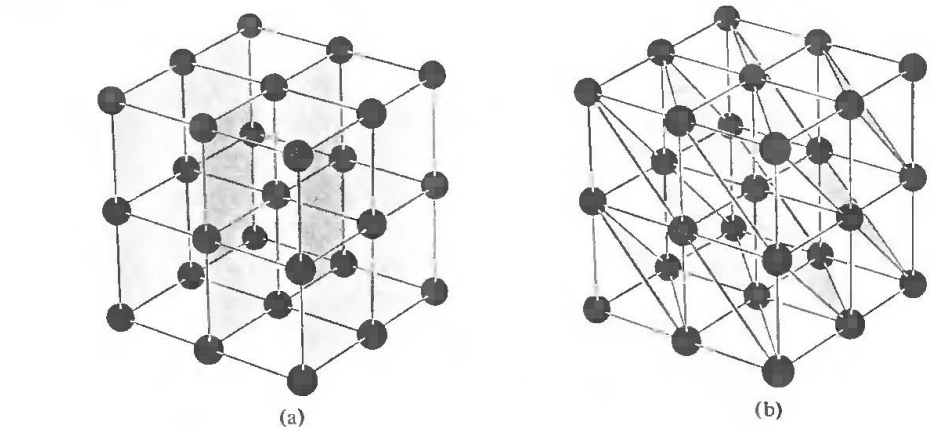
Struttura tetraedrica

Fig. 2.2. Crystalline structure of silicon. The basis consists of two atoms, that at the origin and atom b with coordinates $(a/4)(1, 1, 1)$. The Bravais lattice is face-centered cubic.

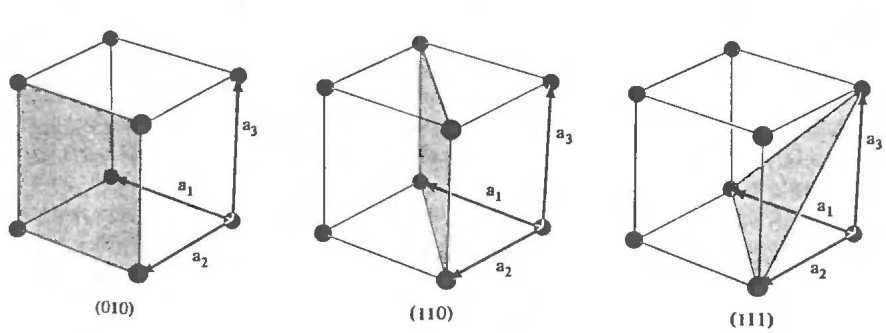
Nel Si • • sono entrambi Si

Nel GaAs • • sono uno Ga e l'altro As

Piani Reticolari



Piano che contiene almeno 3 punti con collineari



PIANI RETICOLARI

- INTERCETTA ASSI-PIANO (x, y, z)
- $\left(\frac{1}{x}, \frac{1}{y}, \frac{1}{z}\right)$
- Denom. comune min.
- Semplifica

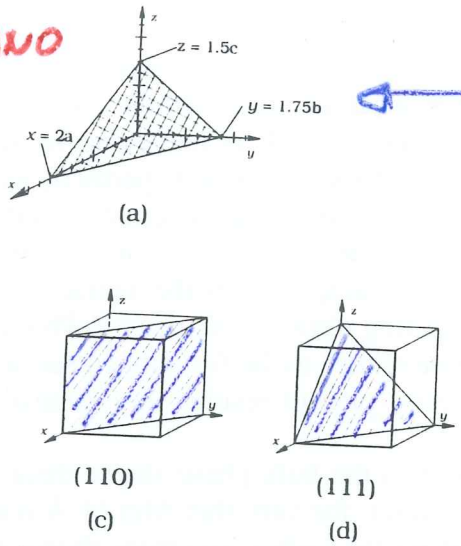
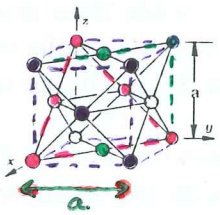


Fig. 1.2. Examples of Miller index notation for lattice planes in a cubic system.

es: $(2, 1.75, 1.5) \rightarrow \left(\frac{1}{2}, \frac{4}{7}, \frac{2}{3}\right) \xrightarrow{\times 42} (21, 24, 28)$



FCC

⊗ 1 layer
o 2 layer
• 3 layer

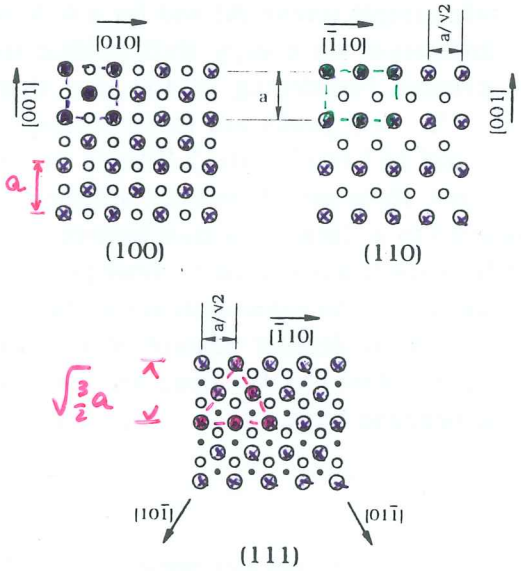


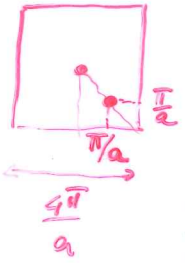
Fig. 1.3. The face-centered-cubic unit cell and the (100), (110), and (111) surfaces of an ideal crystal. The cross-hatched circles represent atoms in the surface layer, the open circles are atoms in the second layer, and the filled circles are atoms in the third layer. Nearest neighbor atoms in the unit cell are shown connected by solid lines.

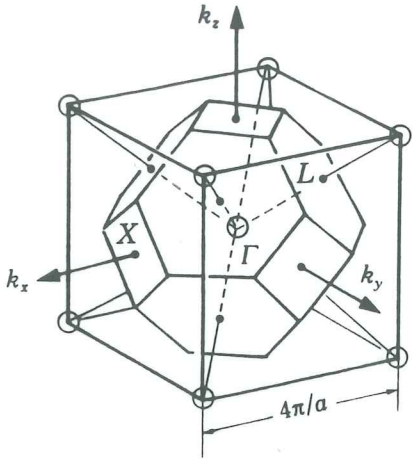
RETICOLO DIRETTO FCC → BCC

$\Gamma \rightarrow (0,0,0)$

$X \rightarrow \left(\frac{2\pi}{a}, 0, 0\right)$

$L \rightarrow \left(\frac{\pi}{a}\right)(1,1,1)$





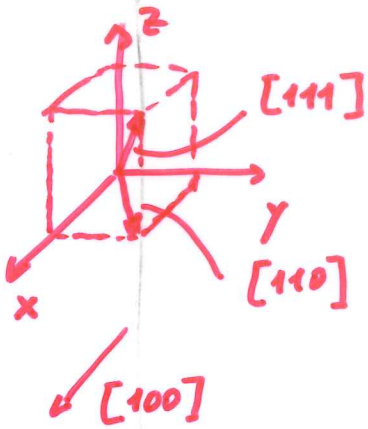
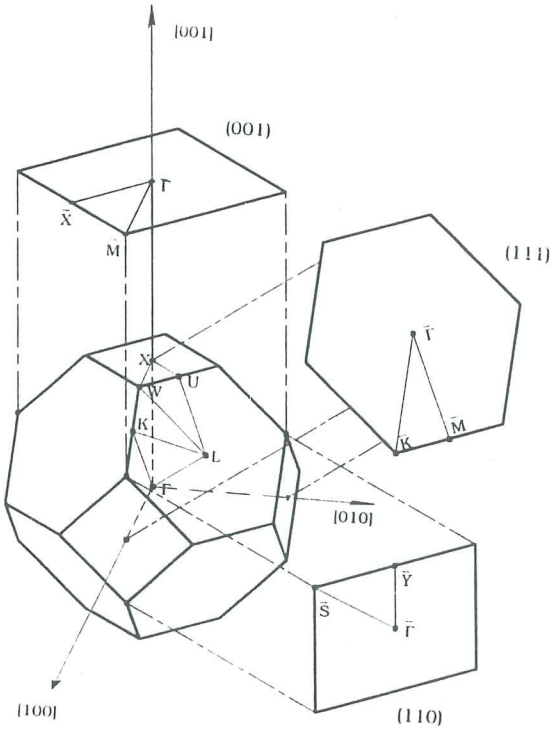


Fig. 2.3. Reciprocal lattice of the face-centered cubic lattice of silicon. This is a body-centered cubic lattice of side $4\pi/a$. We also show the first Brillouin zone. This is bounded by the perpendicular bisector planes of the vectors $(2\pi/a)(1,1,1)$ and their equivalents, producing the hexagonal faces with center L and also by the perpendicular bisector planes of the vectors $(4\pi/a, 0, 0)$ and their equivalents, corresponding to the square faces with center X. The origin Γ is chosen at the atom of the cubic lattice situated at the center of the cube.

$\Gamma \xrightarrow{\Delta} X \quad [100]$

$\Gamma \xrightarrow{\Lambda} L \quad [111]$

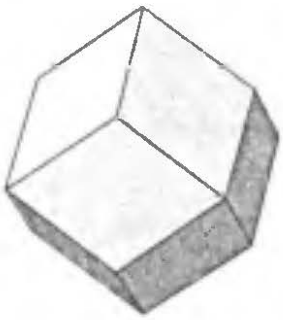
$\Gamma \xrightarrow{\Sigma} K \quad [110]$



Zone di Brillouin per ~~le superfici~~ i piani (001), (110) e (111) di FCC

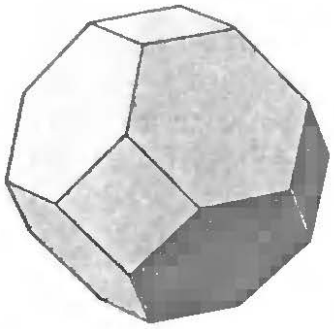
Prima zona di Brillouin

Figure 5.2
(a) The first Brillouin zone for the body-centered cubic lattice. (b) The first Brillouin zone for the face-centered cubic lattice.



(a)

Reticolo diretto
BCC FBZ FCC



(b)

Reticolo diretto
FCC FBZ BCC