Question #54027, Physics / Solid State Physics |

A crystal has a cubic unit cell of 4.2 Å. Using a wavelength of 1.54 Å at what angle (2)
would you expect to measure the (111) peak

Solution:

d-spacing for a cubic cell is defined:

$1/d^2 = (h^2 + k^2 + l^2)/a^2$, where a –the unite cell parameter, d – the separation between lattices.

$1/d^2 = (3)/17.64\times10^{-20}\ m^2 = 0.170068\times10^{20}\ m^2$

$d = 2.4249\times10^{-10}$ m

According to Brag condition the wavelength can be found:

$2d\sin(\Theta) = n\lambda$, where Θ – the angle to measure the (111) peak, and λ – the wavelength of X-ray.

$\sin(\Theta) = 1.54\times10^{-10}\ m / (2\times2.4249\times10^{-10}\ m) = 0.3175$

$\Theta = \arcsin(0.3175) = 18.5^{o}$

Answer:

$\Theta = \arcsin(0.3175) = 18.5^{o}$