1.4: Surface Structures- hcp Metals

This important class of metallic structures includes metals such as Co, Zn, Ti & Ru.

The Miller Index notation used to describe the orientation of surface planes for all crystallographic systems is slightly more complex in this case since the crystal structure does not lend itself to description using a standard cartesian set of axes- instead the notation is based upon three axes at 120 degrees in the close-packed plane, and one axis (the *c*-axis) perpendicular to these planes. This leads to a four-digit index structure ; however, since the third of these is redundant it is sometimes left out !

I. The hcp (0001) surface

This is the most straightforward of the *hcp* surfaces since it corresponds to a surface plane which intersects only the *c*-axis, being coplanar with the other 3 axes i.e. it corresponds to the close packed planes of hexagonally arranged atoms that form the basis of the structure. It is also sometimes referred to as the (001) surface.

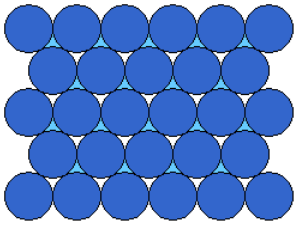

Figure (0001) surface plane, e.g. Ru(0001)

This conventional plan view of the (0001) surface shows the hexagonal packing of the surface layer atoms.

- Which fcc surface does it resemble ?

Summary

We can summarize the characteristics of this surface by noting that:

1. All the surface atoms are equivalent and have CN=9
2. The surface is almost smooth at the atomic scale
3. The surface offers the following adsorption sites:
    - On-top sites
    - Bridging sites, between two atoms
    - Hollow sites, between three atoms