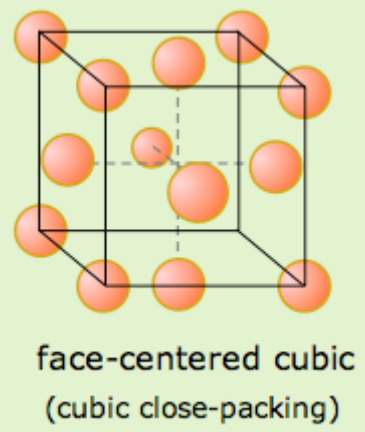
Question #72264, Chemistry / Physical Chemistry

An alloy of copper, silver and gold is found to have copper constituting the ccp lattice. If silver atoms occupy the edge centres and gold is present at body centre, what is the formula of alloy?

Answer*:*
Elements we have are Cu, Ag and Au. CCP lattice or cubic close-packed, is alternative for the face-centered cubic crystal packing system. It consist of:



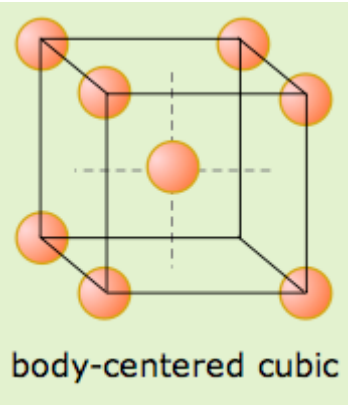
Corner Cu atoms shared by a total of eight unit cells. This means that each corner in a unit cell will contain 1/8th of an atom. For one unit cell, amount of Cu atoms is 8, thus:

$$n(Cu) = 8 \times \frac{1}{8} = 1$$

Silver atoms occupy the edge centres, those are being shared by a total of two unit cells, which means that each edge center in a unit cell will contain 1/2 of an atom. For one unit cell, amount of Ag atoms is 4, thus:

$$n(Ag) = 4 \times \frac{1}{2} = 2$$

Gold is present at body centre:



which means that each edge center in a unit cell will contain 1 of an atom. For one unit cell, amount of Au atoms is 1, thus:

$$n(Au) = 1 \times 1 = 1$$

So, the formula of an alloy is:
$Ag_2Au_1Cu_1$ or **Ag_2AuCu**