

Yes

students. In this lecture we will be

looking at another binary system that is the Al by 10 Northside

system and we will also discuss the crystallization of a

pledge who plays melt.

At the end of this lecture you will be able to understand the

Albertha Northside Phase diagrams as well as understand the

crystallization trend of a pleasure. Please melt.

The Alberta Northside system. This system is important because

it exhibits a solid solution. Now, what is the solid solution?

A solid solution is a state in which both components mix

completely with each other.

So when you have a solid crystal, you will have a mixture

of two components in the same crystal, so that's a solid

solution. So you have the pledge system, which is composed

of any LSI 308 as well as Cal.2 SI 208. Now this is a good

example because we have always studied pleasure place crystals.

These pleasure craze crystals are actually composed of two

components. These components give rise to the two phases

albite and anorthite. Now the phase diagram for Al by 10 or

tight solid solutions.

Series is given here so you have albite on one end and a tie line on the other end of the bulk composition axis. So here this is 100% albite. The zero represents zero percent of anorthite at this point, so this scale is actually talking about the percentage of anorthite. But we can also invert and understand that this is 100% albite. And zero percent albite over here. So 100% anorthite, zero percent albite, whereas 100% albite zero percent anorthite.

Now at each end.

We have the pure component that is albite on the Northside let us look at the crystallization trend in this system. So we begin with the bulk composition, which is about 48% anorthite and 52% albite. So the initial starting composition of the liquid is 48% albite.

So the initial starting composition of the liquid is 48% in Northside and 52% albite that is shown here on the phase diagram. Now as the melt cools to temperature here at about 1430 degrees Celsius, we have the first solid forming. Now the first solid that forms what will be its composition. To know the composition of the first solid.

Or the first crystal of plagioclase that forms. We will have to look horizontally across this field onto the solidus. So in this phase diagram this is the liquidus curve, whereas this is the solidus curve. A solidus curve represents the composition of the solids that are forming.

So at this point, the first crystal that forms will have a composition that is.

Corresponding to point B. Now if we have to know the composition of B, it will be vertically down, about 2, about 90% anorthite and

10% albite. Similarly, if the temperature cools further to this point. The mineral that forms will have a composition corresponding to this point. Now at Point A tells about the composition of the solid. What about the composition of the liquid, the composition of the liquid is given by the point on this liquidus that is a so the composition of the liquid. Here is the starting composition which is 48% in our Titan 52% albite.

Now.

So regardless of the starting composition, the diagram is always read in this manner. So say suppose I had starting

composition here.

If I had a static composition that is marked by this point.

As the point, as the bulk as the liquid cools.

To a point here, the first crystal that forms will be.

Horizontally across and marked at the liquid at the solidus.

Now it should be a horizontal

segment. OK, so regardless of the starting composition.

The first solid to form will always have a composition which

is read horizontally across onto

the solidus. Line.

Estimate cools from A to a temperature of about 1395

degrees Celsius. The composition of the liquid and the

solid phase also changes. Now, what happens as we move

down from A to this point, the crystals that had

formed at this temperature.

Now start reacting with the marriage that they are in

equilibrium with an but reaction takes place. The crystals here

form were richer in our tight, so the CAE from the Northside is

exchange with the Med to take up any from the melt and form more

albertic rich crystals. So as we move from A to this point as we

lower the temperature from 8 to this point we have the

composition of the crystals.

Also, changing along the solidus line.

So now at this temperature, the composition of the solid that forms is given by drawing a straight line down to the horizontal axis. A net will be read to about 84% anorthite and will have about 16% albite. So as we keep on decreasing the temperature, the composition of the solid also keeps changing, so the crystal that forms at B reacts with the melt.

To have a new composition at D as the temperature decreases, its composition keeps changing, keeps changing and also simultaneously the composition of the liquid also keeps changing along the liquidus. Now for this point the composition of the liquid is given by the point C. So if I have to draw a line straight down, it is 40% of Northside and 60% albite. So the liquid is getting richer and richer in albertic component.

As the temperature lowers, the composition of the liquid also moves down the liquidus line at the same time we also have the composition of the crystal continuously changing along the solidus like this happens because the system always tries to maintain equilibrium at all times. As the melt cools from A to this point here we get the

composition of the crystal given by the point D.

The composition of the liquid is read on the Liquidus line, whereas the composition of the solid is read on the solidus line. Now at this temperature, the crystal that had formed earlier at B at higher temperature starts, reacting with the melt to maintain equilibrium. Next in this reaction the Ca from the anorthite crystal is exchanged with the Mg to take up any and hence the crystal, which was richer in anorthite, had 90% anorthite, now becomes slowly and reaches itself in albite, so from 90% it moves down to about

86% anorthite. So the composition now of the new crystal that has formed at this temperature is given by D. Ann.

It is understood by drawing a vertical line straight down to the horizontal axis, which is

86% anorthite. As the temperature lowers, the composition of the melt also migrates down the liquidus line.

At the same time, composition of the crystals that are forming also moves down the solidus line. So as I move from A to lower and lower temperatures, the composition of the liquid keeps moving down the liquidus line,

whereas the composition of the solid keeps moving down the solidus line. So if I have to look at a temperature here, the composition of the solid is given by this point, whereas the composition of the liquid will be given by this point on the liquidus.

This is because the system could slowly so as to maintain equilibrium at all times.

Now the composition of the melt and the crystal moves down simultaneously, exactly opposite to each other.

If the system stays in equilibrium at all times, the final composition must end up where we started, so the final composition of the solid that forms should be equivalent to the initial composition that we started with. Now the crystallization will stop at this temperature by because this point on the solidus corresponds to about 48% anorthite, which is actually the initial composition that we had started with. So initially we started with 48% anorthite. Now it has cooled down to up to point F, where in the final crystal that crystallizes. It is also having 48% anorthite. This crystal that had formed at B continuously reacted with the melt as the temperature

decreased, Ann has now reached 48% and authentic content.

The final pressure plays Crystal to form after the last drop of

the Med has crystallized. Will have the composition

corresponding to this starting composition, which was 48%

enertech 52% Albert. Hence, in an equilibrium system of Alberta

Northside. The initial composition of the melt and the

final composition of this solid should always be the same, and

we say that the process of crystallization is complete.

During crystallization, the proportion of the solid

continuously increases while that of the liquid continually

decreases because as you lower the temperature, we have more

and more solids that are forming, whereas the liquid

proportion is decreasing. How do we understand the proportions of

the solid and a liquid that are there at a particular

temperature? We apply the lever principle, that is.

The proportion of solids is given by the length of the

segment on the opposite side of this bulk composition. So the

segment corresponding to the proportion of solids at deep is

X and the segment corresponding to the proportion of liquid at C

is why? So to get the percentage of liquid and solids?

We look at this equation written. You have the length of

X divided by the total length $X + y$ in 200. Similarly for

percentage of liquid will be the length of Y divided by the total

$X + Y$ in 200.

Thank you.