Introduction to Materials Science and Engineering
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Lecture – 48
Edge, screw and mixed dislocations

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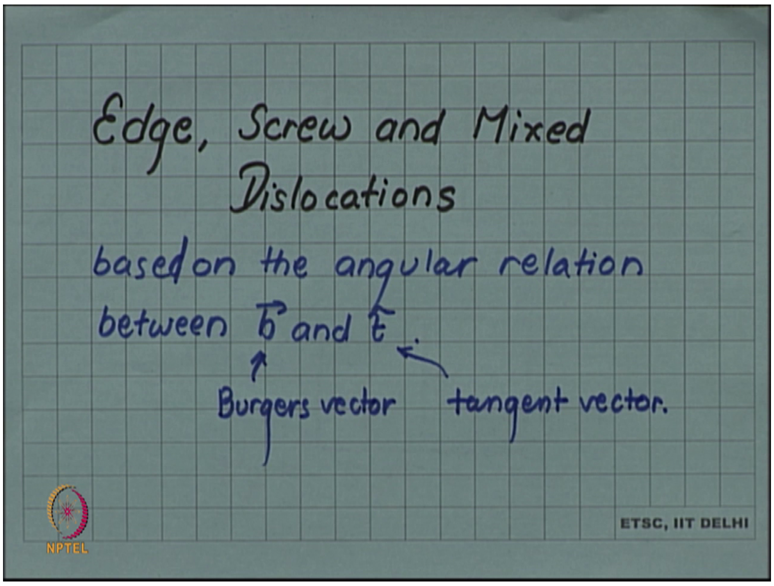

We have seen the edge dislocations previously, but edge is only one of the possible configurations of dislocation line, there are other possible dislocation lines or other possible configurations, which are known as a screw and mixed dislocation. So, let us look at edge screw and mixed dislocations together as a classification of dislocation line, this classification is based on, the angular relation between b and t, the burgers vector and the tangent vector which we discussed in the previous video, burgers vector and the tangent vector.

Let us see we have we have looked at the edge dislocation in detail. So, let us look at the edge dislocations once more, and this was our edge dislocation.

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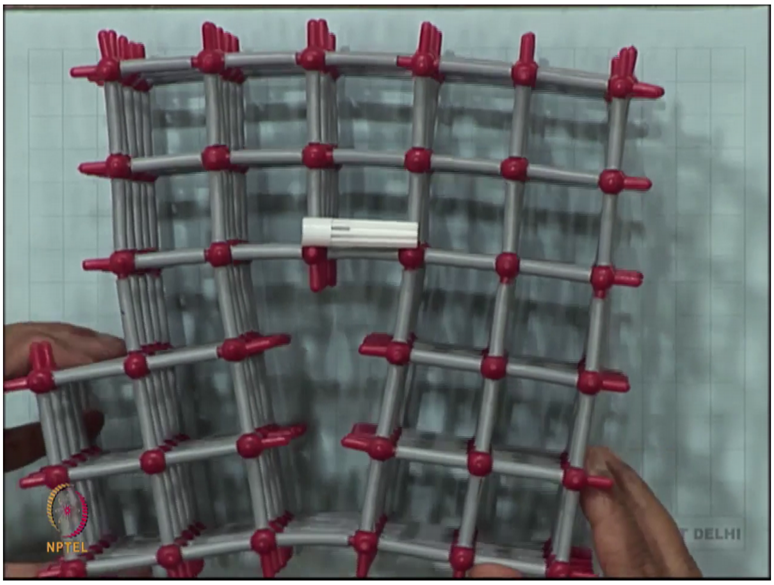

and we said the dislocation line was going in into the page or into your screen. So, it is a horizontal line, which is going into the plane of the drawing, or in this a plane of the model into the model.

Now, you also have the burgers vector which is the magnitude and direction of the slip, and in this case, we said that this plane was pushed in this direction. So, it is a horizontal vector which is in this direction. So, this white pen cap is representing the burgers vector whereas, the black pen will be representing the dislocation line, and you can see that these two are orthogonal they are 90 degree to each other.

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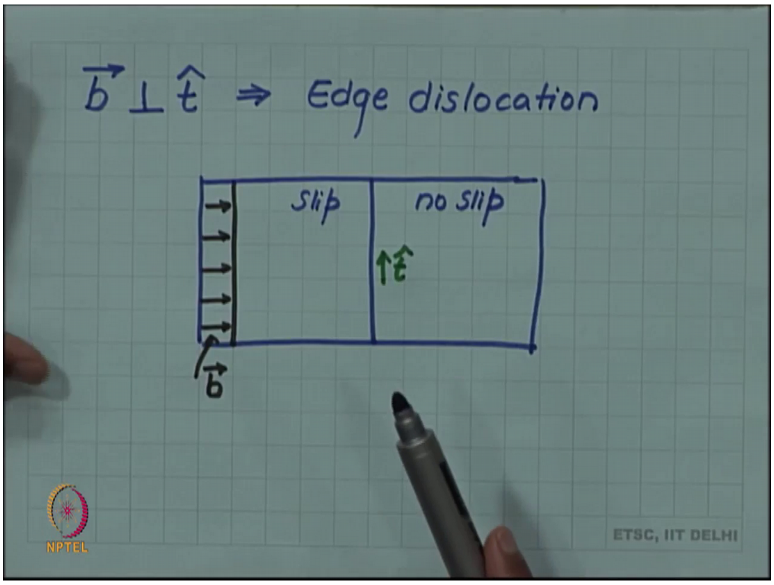

So, in this case we know that for the edge dislocation b and t are perpendicular. So, if b is perpendicular to t, we call the dislocation line and edge dislocation line. So, if we in our slip picture, if we picture it this was the boundary, and when I created a slip from the top view, the first plane went to the position of the second plane, and this was the magnitude and direction of the slip. So, that was b, t of course, is perpendicular so, b and t are perpendicular for an edge dislocation.

But this is not the only way, when I am trying to create a slip this was a slip side and this was the no slip side, when I am trying to create a slip I can if I (Refer Time: 04:28) have a slip in a different direction. So, other possible direction is that b is parallel to t.

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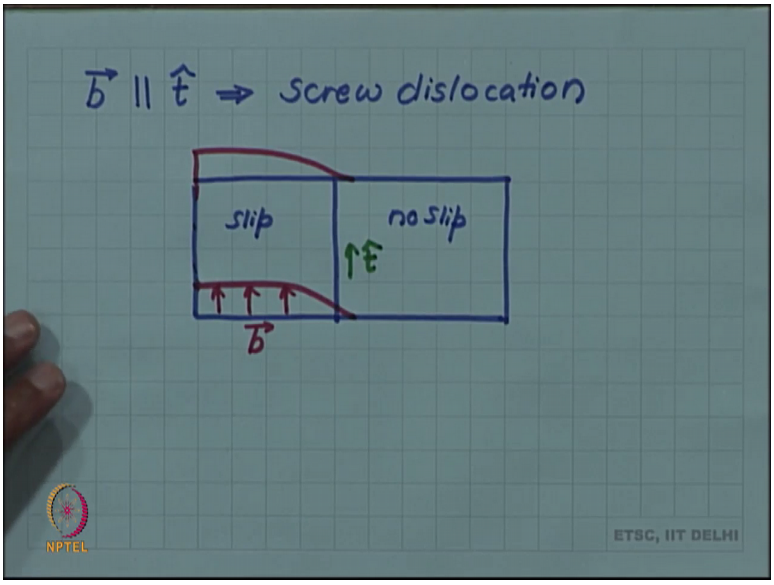

So, if b is parallel to t then the dislocation line is called a screw dislocation, if I again draw that slip plane picture, a slip plane is here, and I want this line to be the dislocation line. So, this side is the slip side and this side is no slip side.

But then for the edge dislocation, I pushed the slip side towards the dislocation line, perpendicular to the dislocation line, but suppose instead I try to slip this region parallel to the dislocation line in this direction, then the new position of the slipped crystal will look something like this, because now I have created a slip in this direction. So, the b is in this direction and t of course, is in the same direction. So, in this case b and t are parallel. So, we call this a screw dislocation you can easily think, that both of these are special cases and a much more general case one can think of where b is at some angle to t.

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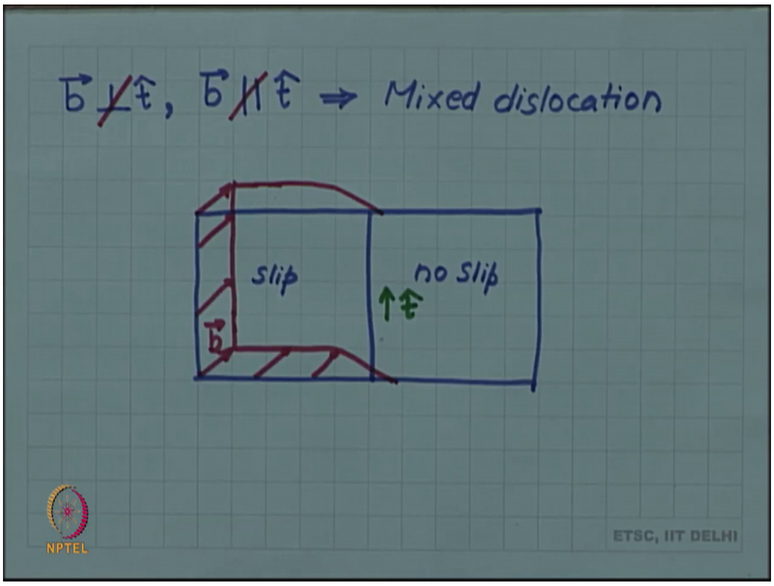

that is b is neither perpendicular to t, it is not perpendicular to t, and not it is parallel to t, b is not parallel to t, it is neither edge nor a screw, but it is at some angle in this case we named the dislocation line a mixed dislocation line mixed dislocation.

So, again if I try to create the slip plane view here is the dislocation line, this is the boundary between slip and no slip, but now I create my slip in this direction let us say. So, the slip region will now look like. So, you can see the slip is now in a direction which is arbitrarily related. So, this is the b burgess vector, but it is neither parallel nor perpendicular to the tangent vector t. So, this will be the mixed dislocation.

So, simply in terms of the relationship of b and t we can see that 3 different kinds of dislocations can be thought of, the edge dislocation be perpendicular to t a screw dislocation be parallel to t, and mixed dislocation which is neither perpend b and t are neither perpendicular nor parallel to t, we have already have we seen an atomic model of the edge dislocation that when b is perpendicular to t, how the atomic model looks like, but we have not yet seen the atomic picture or atomic model of an edge of a screw or mixed dislocation.

So, for a screw dislocation we will see in little bit more detail, how the atomic configuration will look like around the dislocation line. So, that will be a topic of a future session.