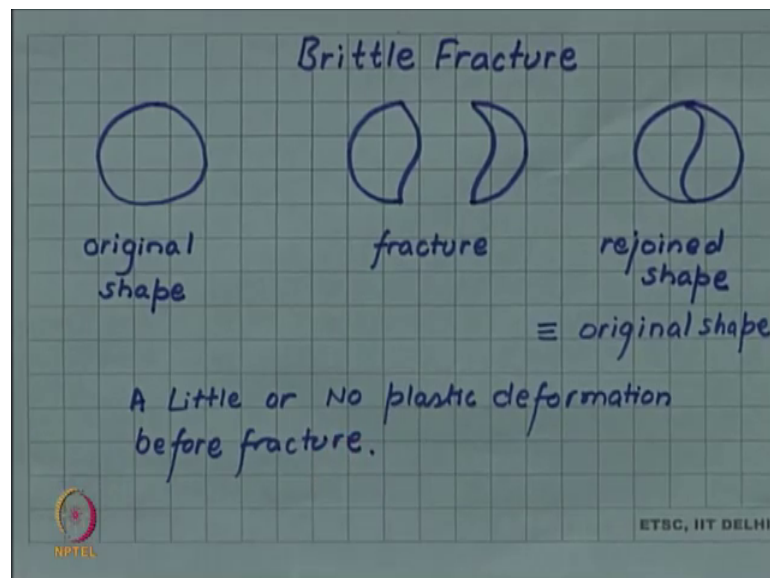


Introduction to Materials Science and Engineering
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Lecture - 138
Ductile and Brittle Fracture

Two kinds of fracture are there; Ductile and Brittle.

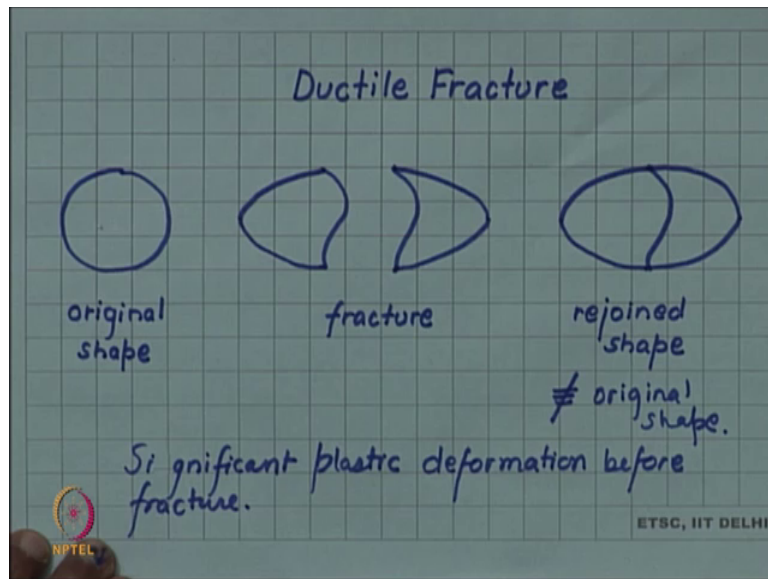
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So, let us look at what do they mean. So, in brittle fracture suppose we have an original shape. So, and fracture takes place breaks it into two pieces, then if we rejoin the broken piece we recover the original shape. So, rejoined shape is the same as original shape. All of us know that if some glass piece breaks, then we can join them with some adhesive to regain the original shape.

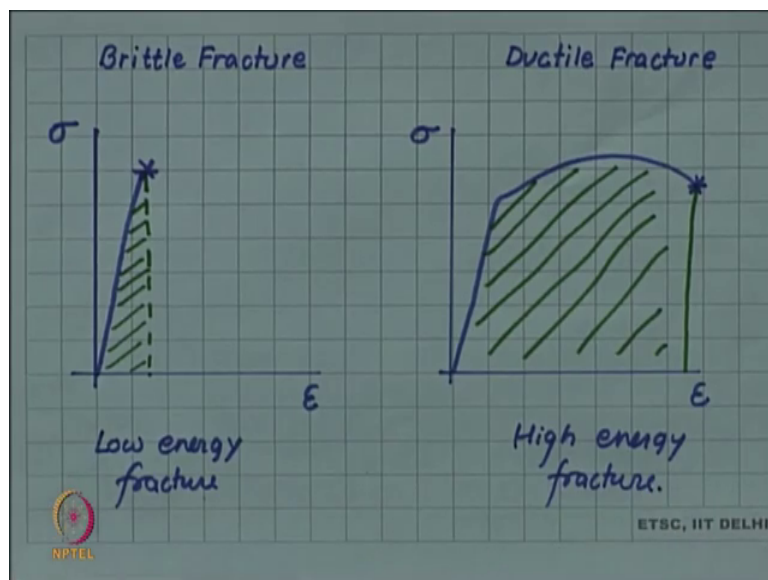
So, this means that there has not been much plastic deformation before fracture so, little, or no plastic deformation before fracture.

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In ductile fracture there is significant plastic deformation before fracture happens. So, original shape deforms plastically before it cracks. So, in this case if we rejoin the cracked pieces, we will not recover the original shape, this is not the same as original shape. So, if we try to look at this. So, there will be significant plastic deformation before fracture.

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Now, if we look at this in terms of a stress and strain stress strain diagram. So, in case of brittle fracture actually, since there is no plastic deformation, fracture will happen in the elastic regime itself. So, this is the fracture point you have a straight line elastic region

whereas, the stress strain diagram for ductile material we will see, significant plastic deformation. So, there will be a lot of deformation before it fractures.

So, you can see that in terms of the two fracture behaviors differently in terms of the energy absorbed, you know that the energy absorbed in up to the point of fracture in stress strain diagram is given by the area under the curve. So, since in brittle fracture this area will be much less compared to that in the ductile fracture.

So, the energy absorbed in brittle fracture is very less whereas, energy absorbed in ductile fracture is much much more. So, it is a low energy, we can call it is a low energy fracture and, this is a high energy fracture.