



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

SOLIDIFICATION

Cooling curves, concept of nucleation and growth

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COOLING CURVES

- Cooling curve is a line graph that represents the change of phase of matter (for metals, typically from liquid to solid)
- In pure metals and alloys with eutectic composition, solidification occurs at a constant temperature
- In case of alloys, temperature does not remain constant during solidification.

NUCLEATION AND GROWTH

- During phase transformation, free energy change determines the rate of transformation.
- At equilibrium melting point, free energy of solid as well as liquid phase are equal.
- For transformation to be possible and to proceed simultaneously, free energy change must be negative.

- Once condition of spontaneous occurrence of phase transformation is satisfied, formation of crystalline configuration among few atoms of liquid starts.
- Further, more and more atoms leave the liquid and join the crystalline configuration.
- Transformation from liquid to solid state is a step to step process and can be divided into two steps, occurring one after the other: formation of tiny stable particles of solid phase (nucleation) and increase in size of these particles (growth).

THANKS

