

MSE-305

Heat Treatment of Metals

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Iron-Carbon Phase Diagram:

Vertical line (y-axis) → temperature from 0°C ~ 1538°C

✚ Horizontal line (x-axis) – carbon content from 0% ~ 6.67%

✚ At 723°C →

1. where pure iron, steel and cast iron loses their magnetism
2. Plain carbon steel up to 0.86% C changes from ferrite and pearlite to austenite and ferrite
3. Plain carbon steel with 0.86% C changes from pure pearlite to austenite
4. Other steel or cast iron with more than 0.86% C changes from pearlite and cementite to austenite and cementite

Solubility Limits of Carbon in Iron

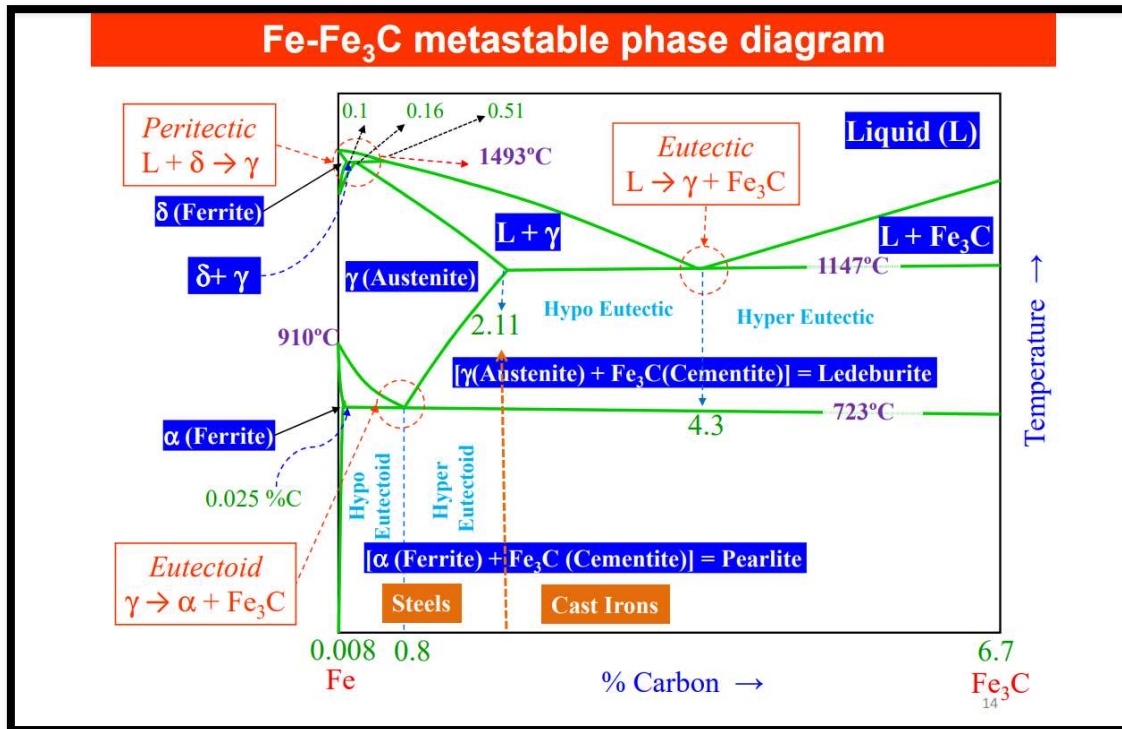
✚ Ferrite phase can dissolve only about 0.022% carbon at 723°C

✚ Austenite can dissolve up to about 2.1% carbon at 1130°C

- The difference in solubility between alpha and gamma provides opportunities for strengthening by heat treatment

✚ Pure Iron melt at 1536°C

✚ Cast Iron melt at 1145°C



TTT –Time Temperature Transformation

“TTT diagram stands for “time-temperature-transformation” diagram. It is also called isothermal transformation diagram.”

****TTT curves are accurate only for phase transformations in which temperature of the alloy is held constant throughout the duration of the reaction. Which means these reactions are isothermal.*

- ✚ A plot of temperature versus log of time.
- ✚ Steel alloy of definite composition.

- ✚ Determines when transformations begin and end for an isothermal (constant temp.) phase transformation of a previously austenitized alloy.
- ✚ Both temperature & time i.e. rate of cooling is taken in consideration.

