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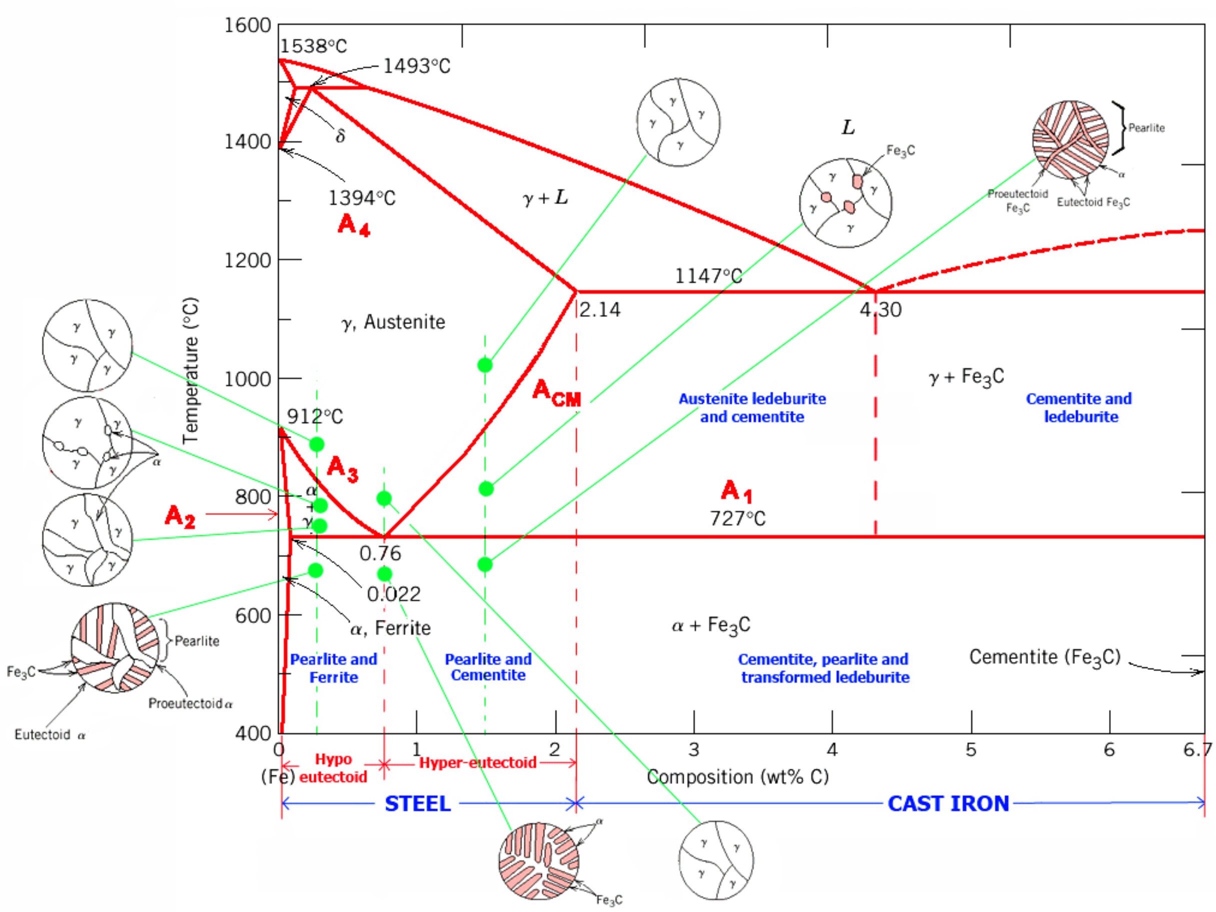
COIMBATORE-641 035, TAMIL NADU

Department of Aerospace Engineering

19AST202 AIRCRAFT PRODUCTION TECHNOLOGY

UNIT V HEAT TREATMENT – SURFACE ENGINEERING - INSPECTION

Iron carbon diagram



The iron-carbon (Fe-C) phase diagram is a graphical representation of the phases that exist in equilibrium at different temperatures and carbon concentrations in an iron-carbon alloy. This diagram is crucial for understanding the behavior of steels, which are alloys of iron and carbon. The phases in the diagram include ferrite, austenite, cementite, and various phases that form during phase transformations.

Here are the key features of the iron-carbon phase diagram:

Phases:

Ferrite (α): A solid solution of carbon in iron with a body-centered cubic (BCC) crystal structure. Ferrite is stable at low carbon concentrations and high temperatures.

Austenite (γ): Another solid solution of carbon in iron, but with a face-centered cubic (FCC) crystal structure. Austenite is stable at high temperatures and higher carbon concentrations.

Cementite (Fe_3C): A compound of iron and carbon with a fixed composition of about 6.7% carbon. It has an orthorhombic crystal structure and is a hard, brittle phase.

Pearlite: A mixture of ferrite and cementite, forming lamellar structures. It is a eutectoid transformation product.

Martensite: A supersaturated solid solution of carbon in iron that forms during rapid cooling. It has a body-centered tetragonal crystal structure and is very hard but brittle.

Phases and Temperature:

The temperature axis represents temperature, typically in degrees Celsius or Kelvin.

The left side of the diagram corresponds to lower temperatures, while the right side corresponds to higher temperatures.

Carbon Content:

The carbon content axis represents the percentage of carbon in the alloy.

The bottom of the diagram corresponds to lower carbon concentrations, while the top corresponds to higher carbon concentrations.

Critical Points:

Eutectoid Point (A_1): The composition (0.76% C) and temperature (727°C) at which pearlite forms during cooling of austenite.

Eutectic Point (A_3): The composition (6.7% C) and temperature (1147°C) at which austenite transforms into a mixture of cementite and austenite during cooling.

Peritectic Point: The point where austenite transforms into a mixture of ferrite and liquid during cooling.

Region Boundaries:

Solubility Limits: The solubility limits of carbon in ferrite and austenite at various temperatures.