

Heat Treatment of Metals

MSE-S305

Classification of ferrous alloys

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➤ Generally, *Carbon content of Steels and cast iron less than 6.67 wt% C.*

➤ On the basis of *carbon concentration*, there are *three types of ferrous alloys*:

- ① **Iron**: It contains less than *0.008 wt% Carbon in α -ferrite at room Temperature.*
- ② **Steels**: It contains carbon between *0.008 wt% C to 2.14 wt% C (usually < 1 wt% C).*
- ③ **Cast iron**: It contains carbon between *2.14 wt% C to 6.67 wt% C (usually < 4.5 wt% C).*

➤ In reality, the classification should be based on '*castability*' and not just on the basis of carbon content.

Allotropes of iron

➤ At atmospheric pressure, *three* allotropic forms of iron exist:

- **α - ferrite** (*BCC crystal structure*)
- **γ - austenite** (*FCC crystal structure*)
- **δ – ferrite** (*BCC crystal structure*)

Steel Types

Types of Steels

- **Heat treatment of Steels requires the knowledge about selection of type of Steel for processing.**
- **In fact, first step is to select the right type of Steel.**
- **In this view, understanding about types and grades of steel contains great importance for getting the precise set of properties after heat treatment.**
- **Based on the carbon content and alloy contents in steels, Steels are mostly grouped as plain carbon steel or alloy Steel.**

Types of Steels

➤ On the basis of the carbon level in the Steel, Plain carbon Steels are grouped under:

- *Low carbon Steels (up to 0.3% carbon)*
- *Medium carbon Steels (0.3% carbon to 0.6% carbon)*
- *High carbon Steels (more than 0.6% carbon)*

➤ Depending on the percentage off alloy content, Alloy Steels are grouped under:

- *Low alloy Steels*
- *High alloy Steels*

➤ Alloy content in low alloy Steels is around 5%, Above 5% alloy Steels are classified as high alloy Steels.

Types of Steels

➤ On Metallurgical ground, steel can be classified as follows:

- *Less than 0.022% carbon steels (up to 0.022% carbon)*
- *Hypo eutectoid steels (0.022% carbon to 0.76% carbon)*
- *Eutectoid steels (equal to 0.76% carbon)*
- *Hyper eutectoid steels (0.76% carbon to 2.14% carbon)*