

2.3 Phases in Iron –Carbon Phase Diagram

The following phase transformations occur with iron-carbon alloys:

Iron-carbon alloys, containing upto 2.06% of carbon, are called steels.

Alloys, containing from 2.06 to 6.67% of carbon, experience eutectic transformation at 2097 °F (1147 °C). The eutectic concentration of carbon is 4.3%.

In practice only hypo eutectic alloys are used. These alloys (carbon content from 2.06% to 4.3%) are called cast irons. When temperature of an alloy from this range reaches 2097 °F (1147°C), it contains primary austenite crystals and some amount of the liquid phase. The latter decomposes by eutectic mechanism to a fine mixture of austenite and cementite, called ledeburite.

Alloys (steels and cast irons) experience eutectoid transformation at 1333°F (723°C).

The eutectoid concentration of carbon is 0.83%

When the temperature of an alloy reaches 1333°F (733°C), austenite transforms to pearlite (fine ferrite-cementite structure, forming as a result of decomposition of austenite at slow cooling conditions).

Phase compositions of the iron-carbon alloys at room temperature

o Hypoeutectoid steels (carbon content from 0 to 0.83%) consist of primary (proeutectoid) ferrite (according to the curve A3) and pearlite.

- o Eutectoid steel(carbon content 0.83%) entirely consists of pearlite.

- o Hypereutectoid steels(carbon content from 0.83 to 2.06%) consist of primary (proeutectoid) cementite (according to the curve ACM) and pearlite.

- o Cast irons (carbon content from 2.06% to 4.3%) consists of proeutectoid cementite C_2 ejected from austenite.

