HEAT TREATMENT LABORATORY

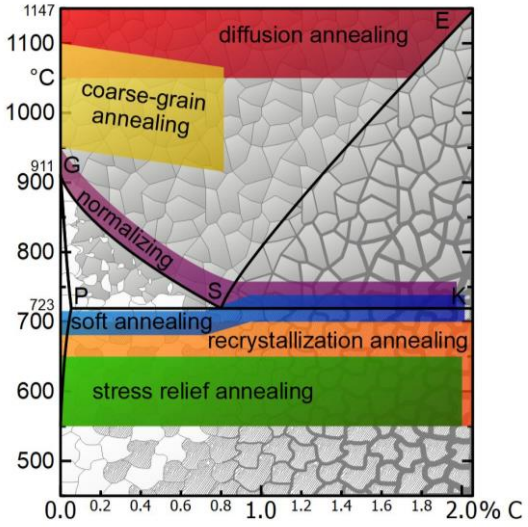
non-Analytical instruments

NON-ANALYTICAL INSTRUMENTS

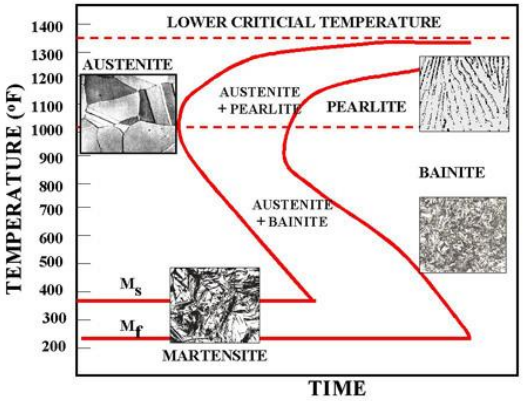
Heat treatment

Introduction

Heat treatment involves the use of heating or chilling, normally to extreme temperatures, to achieve the desired result such as hardening or softening of a material. Heat treatment techniques include annealing, case hardening, precipitation strengthening, tempering, carburizing, normalizing and quenching. This lab is equipped with several electrical resistance furnaces which will be introduced.



Iron-Carbon phase diagram and temperature ranges for different heat treatments



Time-Temperature-Transformation curves corresponding to steel

Shiraz University, Department of Materials Science and Engineering

Device: Tube furnace

Manufacturer: *CARBOLITE*

Technical specifications

Maximum temperature	**1350 °C**
Maximum diameter of the specimens	**25 mm**

*** Capable of employing a flow of inert gas**

Device: Tube furnace

Manufacturer: *AZAR/PA-8*

Technical specifications

Maximum temperature	**1000 °C**
Maximum diameter of the specimens	**25 mm**

*** Capable of employing a flow of inert gas**

Device: Resistance furnace

Manufacturer: *MANUFACTURED IN-HOUSE*

Technical specifications

Maximum temperature	**1200 °C**

Device: Resistance furnace

Manufacturer: *EXCITON/ATASH-1200*

Technical specifications

Maximum temperature	**1200 °C**

Device: Resistance furnace

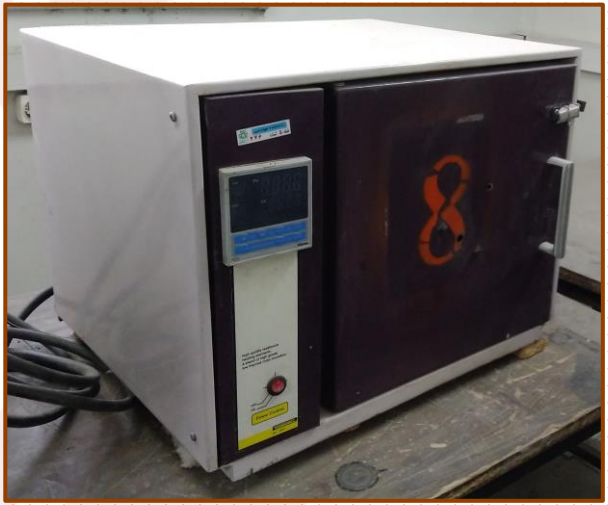
Manufacturer: *MELTECH*

Technical specifications

Maximum temperature	**800 °C**

Device: Resistance furnace

Manufacturer: *ASAN GODAZ*



Technical specifications

Maximum temperature	**1000 °C**

*** Equipped with a controller to set temperature regime**

Device: Resistance furnace

Manufacturer: *EXCITON*

Technical specifications

Maximum temperature	**1200 °C**

Device: Resistance furnace

Manufacturer: *EXCITON*

Technical specifications

Maximum temperature	**1200 °C**

Device: Resistance furnace

Manufacturer: *EXCITON*

Technical specifications

Maximum temperature	**1200 °C**

Device: Resistance furnace

Manufacturer: *EXCITON*

Technical specifications

Maximum temperature	**1250 °C**

*** Equipped with controller to set temperature regime**

Device: Resistance furnace

Manufacturer: *EXCITON*

Technical specifications

Maximum temperature	**1500 °C**

*** Equipped with controller to set temperature regime**

Device: Salt bath furnace

Manufacturer: *EXCITON*

Technical specifications

Maximum temperature	**1000 °C**

Device: Oven

Manufacturer: *HERAEM*

Technical specifications

Maximum temperature **220 °C**

*** Equipped with a fan**

Device: Oven

Manufacturer: *RIDSDALE*

Technical specifications

Maximum temperature **220 °C**

Jominy end quench test

Introduction

Standard Jominy end quench test specimen

Hardenability is the ability of a steel to partially or completely transform from austenite to some fraction of martensite at a given depth below the surface, when cooled under a given condition. For example, a steel of a high hardenability can transform to a high fraction of martensite to depths of several millimeters under relatively slow cooling, such as an oil quench, whereas a steel of low hardenability may only form a high fraction of martensite to a depth of less than a millimeter, even under rapid cooling such as a water quench. Hardenability therefore describes the capacity of the steel to harden in depth under a given set of conditions. The steel sample is normalized to eliminate differences in microstructure due to previous forging, and then austenitized. This is usually at a temperature of 800 to 900°C. The test sample is quickly transferred to the test machine, where it is held vertically and sprayed with a controlled flow of water onto one end of the sample. This cools the specimen from one end, simulating the effect of quenching a larger steel component in water.

Device: Jominy end quench test setup

Manufacturer: *METASERV*

This lab is equipped with a Jominy end quench test apparatus as shown.