



Class: 2nd stage

Subject: Materials Science lab



**Ministry of Higher Education and Scientific Research
Al-Mustaqbal University College**

**Chemical engineering and petroleum industries
(Materials Science lab)**

**Experiment No.4
(Creep test)**

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Aim of the experiment: to study the mechanical behavior of materials during creep test

Theory:

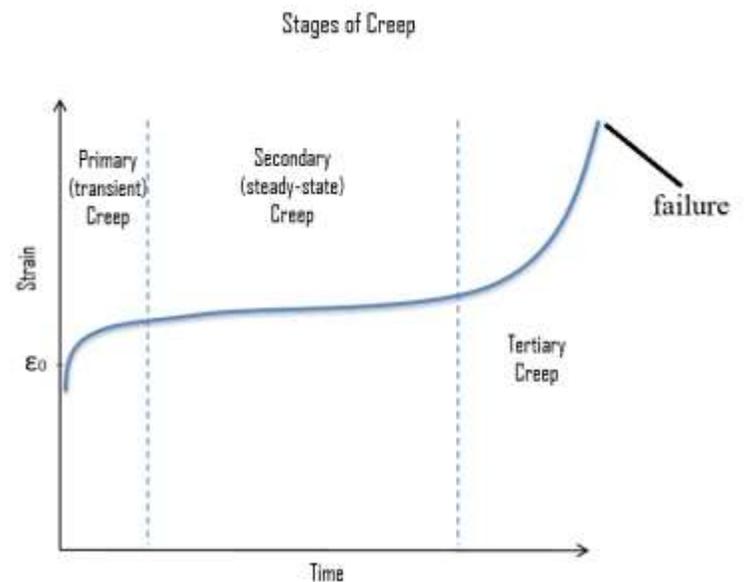
Creep is the tendency of a solid material to deform permanently under the influence of persistent thermal and mechanical loads over time.

Creep is a type of deformation that is important and experienced in a wide range of industries ranging from nuclear power plants, jet engines and even heat exchangers.

Temperature has important effects on deformation phenomena. Microstructural defect rearrangements are often accelerated at high temperatures. Since these processes tend to soften the material, they counteract the strain hardening produced by plastic deformation.

There are three main stages of creep:

- **Primary Creep:** starts at a rapid rate and slows with time.
- **Secondary Creep:** has a relatively uniform rate.
- **Tertiary Creep:** has an accelerated creep rate and terminates when the material breaks or ruptures. It is associated with both necking and formation of grain boundary voids.



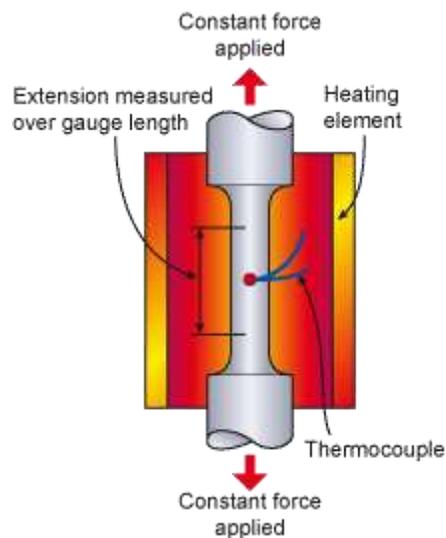
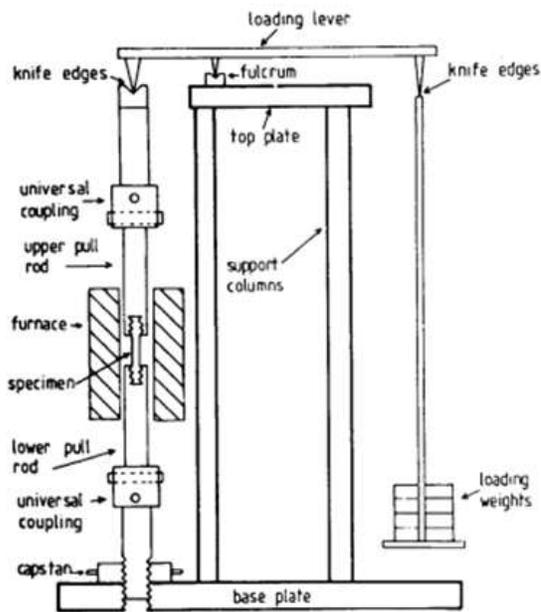


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Creep testing is conducted using a tensile specimen to which a constant stress is applied at a constant temperature, often by the simple method of suspending weights from it. The test is recorded on a graph of strain versus time.





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Reducing creep in materials

In general, there are three general ways to **prevent creep in metal**. One way is to **use higher melting point metals**, the second way is to **use materials with greater grain size** and the third way is to use **alloying**.

Discussion:

- 1- What is creep?
- 2- What are the stages of creep?
- 3- How can we reduce creep in materials?