SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF MECHANICAL ENGINEERING

23MET203 & Engineering Materials and Metallurgy

II YEAR / III SEM

UNIT – 1

MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

PLASTIC DEFORMATION

Mechanisms of plastic deformation-slip and twinning.
Types of fracture.
Testing of materials under tension, compression and shear loads.
Hardness tests-Brinell, Vickers and Rockwell
Impact test - lzod and Charpy
Fatigue failure Creep Failure Mechanism

PLASTIC DEFORMATION

Plastic deformation is defined as a process in which the object due to applied force changes its size or shape in a way that is not reversible.

Plastic deformation is seen in many objects, including:

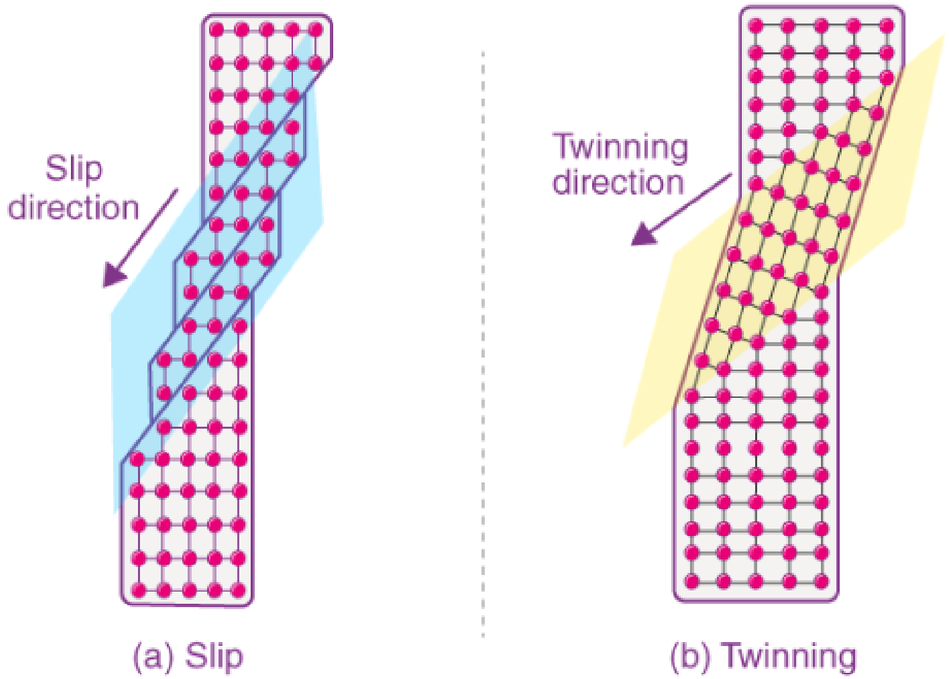
- Plastics
- Metals
- Soils
- Rocks
- Concrete

There are two prominent mechanisms of plastic deformation in metals and they are

1. Slip
2. Twinning

Slip and Twinning

Slip is the prominent mechanism of deformation in metals. A slip involves the sliding of blocks of crystal over one another along different crystallographic planes known as slip planes. In twinning, the portion of crystals takes up an orientation related to the orientation of the rest of the untwined lattice in a symmetrical and definite way.



MECHANISMS OF PLASTIC DEFORMATION-SLIP AND TWINNING

Slip	Twinning
Occurs in discrete multiples of atomic spacing	The movement of atoms is lesser in atomic spacing
The orientation of the crystal above and below the slip plane is the same after deformation as before.	Orientation difference takes places across the twin plane
Occurs over a wide plane	Every atomic plane is involved
Slip occurs when shearing stress on the slip plane in the slip direction strikes a threshold value known as the critical resolved shear stress.	No critical resolved shear stress for twinning.
Takes places in several milliseconds	Takes place in few microseconds
Slip lines are present in even or odd numbers	Twin lines occur in pair

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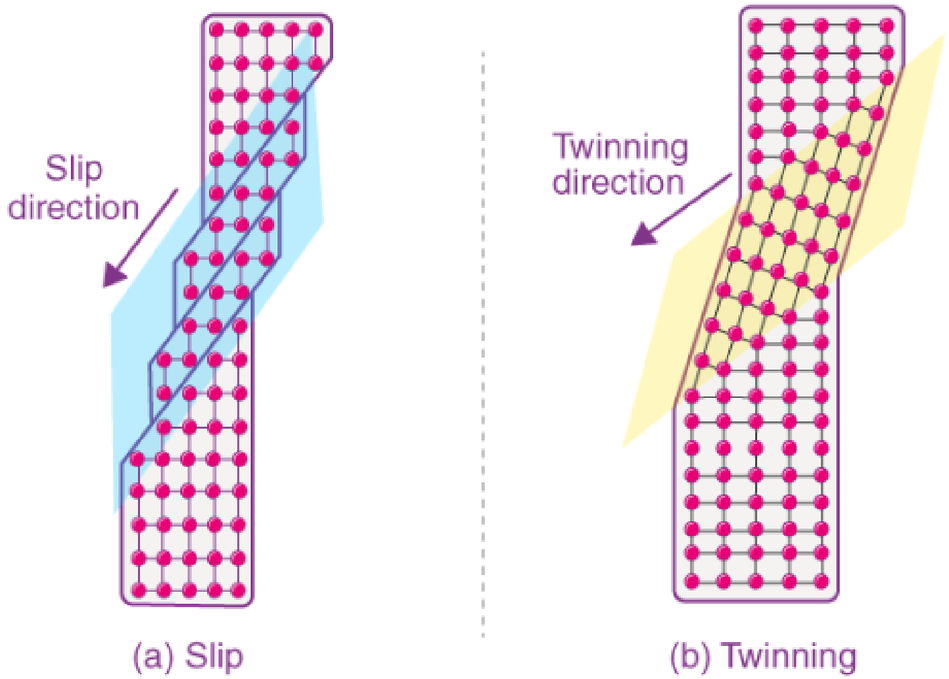

Thank You