

Elastic Property of Matter.

(1) Elasticity: The property of matter by virtue of which a body tends to regain its original shape and size after the removal of deforming force is called elasticity.

(2) Plasticity: The property of matter by virtue of which it does not regain its original shape and size after the removal of deforming force is called plasticity.

(3) Perfectly elastic body: If on the removal of deforming forces the body regain its original configuration completely it is said to be perfectly elastic.

A quartz fiber and phosphor bronze (an alloy of copper containing 4% to 10% tin, 0.05% to 1% phosphorus) is the nearest approach to the perfectly elastic body.

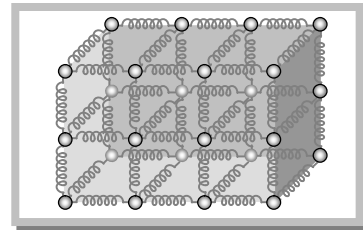
(4) Perfectly plastic body: If the body does not have any tendency to recover its original configuration, on the removal of deforming force, it is said to be perfectly plastic.

Paraffin wax, wet clay are the nearest approach to the perfectly plastic body.

Practically there is no material which is either perfectly elastic or perfectly plastic and the behavior of actual bodies lies between the two extremes.

(5) Reason of elasticity: In a solids, atoms and molecules are arranged in such a way that each molecule is acted upon by the forces due to neighboring molecules. These forces are known as intermolecular forces.

For simplicity, the two molecules in their equilibrium positions (at inter-molecular distance $r = r_0$) (see graph in article 9.1) are shown by connecting them with a spring.



In fact, the spring connecting the two molecules represents the inter-molecular force between them. On applying the deforming forces, the molecules either come closer or go far apart from each other and restoring forces are developed. When the deforming force is removed, these restoring forces bring the molecules of the solid to their respective equilibrium position ($r = r_0$) and hence the body regains its original form.

(6) Elastic limit: Elastic bodies show their property of elasticity up to a certain value of deforming force. If we go on increasing the deforming force then a stage is reached when on removing the force, the body will not return to its original state. The maximum deforming force up to which a body retains its property of elasticity is called elastic limit of the material of body.

Elastic limit is the property of a body whereas elasticity is the property of material of the body.

(7) Elastic fatigue: The temporary loss of elastic properties because of the action of repeated alternating deforming force is called elastic fatigue.

It is due to this reason

(i) Bridges are declared unsafe after a long time of their use.

(ii) Spring balances show wrong readings after they have been used for a long time.

(iii) We are able to break the wire by repeated bending.

(8) Elastic after effect: The time delay in which the substance regains its original condition after the removal of deforming force is called elastic after effect. It is the time for which restoring forces are present after the removal of the deforming force it is negligible for perfectly elastic substance, like quartz, phosphor bronze and large for glass fiber.