Void ratio, e, **defined as the ratio of volume of void space (occupied by both water and air) to volume of solids.**

Porosity, *n,* defined as the ratio of volume of void space to total volume of soil mass.

Degree of saturation, *S,* defined as the ratio of volume of water to volume of void space,

Two such processes well known to geotechnical engineers are **consolidation and compaction**. Consolidation is a process involving reduction of void ratio as a result of load application on a soil mass, which is completely saturated with water. This is an important process that governs settlements of structures. Compaction involves reduction of void ratio as a result of expulsion طرد الهواء of air phase, generally aimed at increasing the dry unit weight of a soil mass.

Figure below shows schematic phase diagrams that illustrate the distinction between the two processes

SOLIDS COMPOSITION AND CHARACTERIZATION

The experimental determination of particle sizes involves mechanical sieving for particles larger than 0.075 mm, and hydrometer analysis for particles smaller than 0.075 mm. The mechanical sieving involves using sieves of known mesh sizes to determine the fraction of solid particles passing through each sieve

Three limits are in general used to characterize the clayey soils:

1. Shrinkage limit, which is the water content at which the soil passes from solid to semisolid state
2. Plastic limit, which is the water content at which transition from semisolid to plastic state takes place
3. Liquid limit, which indicates the water content required in order for the clayey soil to begin exhibiting flow characteristics like liquids.