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TOPIC: SOIL COLLOIDS

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SOIL COLLOIDS

The colloidal complex of soils that consists chiefly of clay and humus and plays important role in ion exchange and fertility. Generally particle size iess than 0.002mm are considered as soil colloids.

Properties of soil colloids

1. High external surface area. eg. Silicate clays have very high internal and external surface area. 1 gram clay have thousand times more surface area than 1g sand.
2. May carry (+) or (-) charges. But most of them carry (-) charge. This (-) charge comes from
   i. Ionisable hydrogen ions
   ii. Isomorphism substitution

Ionisable hydrogen ion means the hydrogen ion locked in hydroxyl (OH^-) ion. Isomorphism substitution is the substitution of one ion for another of similar size. If cations are replaced with other cations with lower (+) charge then excess (-) charge remains on clay surface mainly O^- anion. (eg. Si^{4+} replaced by $Fe^{3+,}$ Al^{3+} replaced by Mg^{2+} etc.)

3. Adsorption of cations: the excess anions attracts (+) charged cations.
4. Adsorption of water on internal and external surface area
5. Cohesion: sticky ness comes due to the affinity towards water.
6. Adhesion
7. Swelling and shrinkage
8. Dispersion and flocculation: it depends on opposite or same charges on particles.
9. Brownian movement: when a suspension of colloidal particles are examined under a microscope the particles seem to oscillate. The oscillation is due to the collision of colloidal particles or molecules with those of liquid in which they are suspended. The smaller the particle the more rapid is its movement. Colloidal particles in water are always in a constant state of motion.
10. Non permeability: colloids are unable to pass through a semi permeable membrane. Even though these are extremely small, they are bigger than molecules of crystalloids dissolved in water..

Types Of Soil Colloids

1. Crystalline silicate clays like phyllosilicates (smectite, vermiculite, montmorillonite etc)
2. Non crystalline silicate clays like amorphous clay (allophane, imogolite)
3. Iron and aluminium oxides like gibbsite, goethite etc
4. Organic (humus) colloid: non crystalline colloids dominated by long carbon chain molecules. It has very high capacity to adsorb water. Long chain of carbon bonded with nitrogen, oxygen and hydrogen. Contains both (+) and (-) charges but net charge is (-).