

Instructional Objectives for Topic 6 (Sorption Phenomena on Soils)

After we conclude Topic 6 in the notes you should be able to do the following:

1. Distinguish between adsorbate, adsorptive, and adsorbent.
2. Explain in your own words adsorption, sorption, specific adsorption, inner-sphere complex, non-specific adsorption, and outer-sphere complex.
3. Distinguish between monodentate and bidentate; mononuclear and binuclear.
4. Describe the different functional groups found on inorganic and organic solids.
5. Explain the differences between adsorption and ion exchange.
6. List the characteristics of cation/anion adsorption.
7. Based on the acid-base properties and the coordination of the surface cation explain the reactivity of mineral surface functional groups.
8. Based on the chemistry of metal cations/anions (i.e. electronegativity, electrostatics, shared charge, and hydrolysis constant) determine their affinity for a particular mineral surface.
9. Distinguish between metal cation/anion adsorption and desorption.
10. Distinguish between anion and cation adsorption.
11. List the factors that affect organic-metal complexation.
12. Explain in your own words the term ternary complex and provide examples of the different types.
13. Distinguish between heterogeneous and homogeneous nucleation, precipitation and co-precipitation.
14. Identify examples of co-precipitation.
15. Identify different types of adsorption isotherms.
16. Given adsorption data (i.e. solution and sorbed concentrations) apply the Langmuir adsorption isotherm equation in both linear and non-linear forms and calculate an adsorption maximum.

17. Explain natural attenuation and list the mechanisms involved with metal natural attenuation in soils.
18. Given the chemical, physical, and mineralogical characteristics of a soil and contaminant metals of concern, determine whether MNA is applicable and if not what can be done to the system for MNA to work.
19. Given a site with trace element contamination and provided the chemical, physical, and mineralogical characteristics of the soil, evaluate different remediation techniques.