Soil Physical Chemistry - SOIL.7100
2020 Course Outline

INSTRUCTOR: Dr. O. O. Akinremi

What we shall cover over the next 24 or so lectures:

A) Introduction - What is soil physical chemistry?
- Chemical Thermodynamics - 1st and 2nd Laws
- Basic definition of system and thermodynamic variables.
- Thermodynamics of soil solution

B) Chemical Kinetics

C) Application of thermodynamics and kinetics to soil system
- Adjusting rate constant for water and temperature effects
- Adsorption, sorption and retention processes
- P sorption using an equilibrium approach
- P sorption using a kinetic approach.
- Convergence of kinetic and equilibrium approaches

D) Diffusive transport of ions in soil (e.g. Phosphorous)
Ficks First Law
Ficks Second Law
Diffusive transport without chemical reaction assuming no adsorption
e.g. Cl^- and Br^-
Diffusive transport with chemical reaction
e.g. Using Sorption Isotherm
-Effect of type of sorption isotherm
-Differences amongst soils

E) Movement of water in the soil water - Darcy's law
1) Saturated Flow 2) Unsaturated Flow
Convective-Dispersive Equation of Chemical Transport
e.g. Nitrate vs. chloride

F) Other topics of interest?

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2020 Course Evaluation Scheme

Assignment 1 - Literature review paper and online presentation on methods of studying soil chemical kinetics - **Paper 20% oral presentation is 5% total is 25%**

Assignment 2 - Literature review paper and online presentation on popular kinetics models used to describe important environmental processes e.g. denitrification, nitrification and mineralization- **Paper 20% oral is 5% total is 25%**

Assignment 3 - Literature review paper and online presentation on approaches for describing transport of chemical species (Cl^-, NO_3^-, PO_4^{-3}) in the environment - **Paper 20% oral is 5% total is 15%.**

Assignment 4 - Topic of interest and relevance to you?

Assignments 1 to 3 require written papers (5-7 pages with 1.5 spacing worth 20%) and an online presentation on the assigned topic (worth 5%).

Recommended Texts

1. Soil Physical Chemistry (2nd Edition, 1998) - Sparks D.L. (Editor)

2. Rates of Soil Chemical Processes (1991) SSSA Special Publication No. 27

3. Kinetics of Soil Chemical Processes (1988) - Sparks D.L.

4. Chemistry of the Solid-Water Interface - (1992) W. Stumm

5. Physical Chemistry (1965) Moore, W.J.

6. Environmental Soil Chemistry - (2nd Edition, 2003) D.Sparks

7. Environmental Soil Physics - (2000) D.Hillel

8. Chemistry in the Soil Environment (1981) - ASA Special Publication No. 40