CATION EXCHANGES IN CLAY LOAM FROM BOGOR, WEST JAVA

(Pertukaran Kation pada Tanah Liat asal Bogor, Jawa Barat)

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ABSTRAK
Kapasitas tukar kation dan koefisien selektivitas merupakan parameter penting yang mempengaruhi distribusi kation antara fase larutan dan fase padatan, dan mobilitasnya di dalam tanah. Studi tentang pertukaran kation melalui koefisien selektivitas pada tanah clay loam Bogor, Jawa barat yang ditanami sawi (Brassica juncea) telah dilakukan. Kation-kation utama yang dipelajari adalah Ca, Mg, K dan Na. Kompleks adsorpsi di dalam tanah tersebut didominasi oleh Ca dan Mg. K dan Na sangat sedikit diadsorpsi. Koefisien selektivitas antara ion adalah $K_{Ca,Mg}$, $K_{K,Ca}$, $K_{Na,Ca}$, $K_{K,Mg}$, $K_{Na,Mg}$ dan $K_{Na,K}$ adalah 0.67, 0.57, 0.37, 0.25, 0.32, dan 1.36. Koefisien selektivitas yang diperoleh didalam studi berada pada kisaran dari hasil studi lainnya. Didalam studi ini akan ditunjukkan penggunaan koefisien selektivitas untuk persiapan digunakan di dalam persamaan-persamaan transport kation.

Kata kunci: Selectivity coefficient, cation exchange capacity, cation absorption

INTRODUCTION
The transport and retention behavior of dissolved chemicals applied to soils is influenced by several physical, chemical, and biology process. The ability to predict the fate of dissolved chemicals is dependent upon our understanding of the processes that govern their fate in the soil environment. Several types of retention reactions influence the movement of dissolved chemicals in soils, e.g., precipitation, adsorption, and ion exchange (Robbins et al., 1980; Thabet et al., 1996; Vogeler et al., 1997). Reaction rate may be sufficiently fast and reversible so that equilibrium can be assumed. Alternatively, retention reaction when incorporated into a transport model may be described using a kinetic approach.

Prerequisite data for describing the transport of cation in soils are their cation exchange capacity (CEC) and the affinity is often expressed by selectivity coefficients.

In this paper will present binary cation exchange properties and selectivity coefficients in clay loam of top soil from Bogor, West Java to incorporate to equilibrium exchange model of Robbins et al., (1980) to prepare used in the transport equations. In this paper also will be discussed using selectivity coefficients to manage soil solutions.

THEORY
Cation exchange reactions can be described by one of two conventions. The Vanselow convention designates the anion exchange charge as $-1$ and the reacting cations are designed in molar quantities. The exchange reaction is represented as:

$$nMX_m + mN^{n-} = nM^{m+} + mNX_n$$

(1)

Where M and N are cations with charges of $m^+$ and $n^-$, respectively. The Gapon convention represents the cation reacting as equivalents and takes the form

$$X_{1/mM} + 1/nN^{n-} = X_{1/nN} + 1/mM^{m+}$$

(2)

Still maintaining a-1 charge on X. It should be recognized that on a molecular scale $1/mM^{m+}$ or $1/nN^{n-}$ (for $m>1$ and $n>1$) does not exist, however, on a macro scale this form is thermodynamically equivalent and better lends itself to modeling multication systems.