CHAPTER V

Summary

Soil samples used in this experiment are different both physical and chemical properties. The major cation exchange materials of Ban Mi (Bm), Kamphaeng Saen (Ks), Pak Chong (Pc) and Narathiwat (Nw) series are montmorillonite (Mt), kaolinite and illite (Kt+I), kaolinite and montmorillonite (Kt+Mt), and organic soil or humus, respectively. The adsorption and desorption were studied in batch experiment. Three heavy metals (as chloride), namely, cadmium (Cd), nickel (Ni) and zinc (Zn) were selected in the study due to their toxic effect and/or micronutrient supply. Calcium chloride (0.01 M) was used as an electrolyte (Ca^{2+} as reference ion) to stimulate the situation in the surrounding soil solution. Results form the investigation the conclusion could be drawn as follows :

1. Selective adsorption of heavy metal ions increase significantly as their concentrations have been increased.

2. On three tested mineral soils, the selective adsorption by natural soils showed better relative adsorption of Zn than Ni and Cd, but on organic soil (Nw) the sequence was changed to be Ni > Zn > Cd. The most suitable adsorption data for the Langmuir equation was the selective adsorption of Zn by Pc (R^2 = 0.987), where the least was the selective adsorption of Zn by Nw (R^2 = 0.468).

3. The relative affinity of natural soil series and/or major cation exchange materials were derived for the selective adsorption of the respective cations :

Cd : Bm > Pc > Ks-Nw	or Cd : Mt > Kt+Mt > Kt+I, humus
Ni : Bm - Pc >> Ks-Nw	Ni : Mt, Kt+Mt >> Kt+I, humus
Zn : Bm > Pc > Nw-Ks	Zn : Mt > Kt+Mt > humus, Kt+I

4. The selective adsorptions by calcium - saturated soils were similar to the natural soils. The sequence is in the order; Zn > Ni > Cd. The selective adsorption of Ni by calcium - saturated Pc showed the best relationship for the Langmuir parameters (R^2 = 0.995). The poor relationship for those parameters was bound in Ni adsorption on calcium-saturated Bm (R^2 = 0.633). Calcium saturation treatment in mineral soils stimulates increasing of the amount and affinity of heavy metals adsorptions for mineral soils.

5. The selective heavy metals adsorption on Bm series was pH dependent, while the other series are not.

6. Estimated relative affinity from heavy metal desorbability of soil samples decreased in the order; Ks > Pc > Bm. To predict the availabity of heavy metals on plant must be distinguished to chemical forms, amounts of adsorbed and desorbed of metal ions on clay.

7. The application of this studying, using the adsorption isotherm data to predict the field performance of Cd, Ni and Zn when applied to the same soil series. The useful indications make the more rapid predictions of field dosages which are required to achieve a phytotoxicity and pollution effect. However, the adsorption and desorption characteristics of heavy metal under batch experiments can at least provide performance of heavy metal prediction. Under field condition, the situation is very different hence, the charcteristics of heavy metal are affected.

8. Because of the complexicity between heavy metal and heavy metal as well as heavy metal and soil, further studies should be focused on soil adsorption and desorption of heavy metal mixtures both in laboratory and field study.

9. The fate of heavy metal as moving through soil in

vertical direction should be studied. The obtained data may be used for predicting or prevention of heavy metal contamination into ground water.