



## SDI FINAL EVALUATION FORM 1.1

### PART 1:

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| Journal Name:            | <a href="#">American Chemical Science Journal</a>                                          |
| Manuscript Number:       | 2013 ACSj 4299                                                                             |
| Title of the Manuscript: | Equilibria and kinetic studies on the adsorption of Cadmium onto Cameroonian wetland clays |

### PART 2:

| FINAL EVALUATOR'S comments on revised paper (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Authors' response to final evaluator's comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <p>The manuscript looks much better after the first revision but it still needs improvement. There are many grammatical and pronunciation mistakes. Here are the specific comments and suggestions which need to be addressed in the revised manuscript.</p> <p>Page 1 (Keywords) – Add “Cadmium” as a keyword.</p> <p>Page 5 (Section 2.5. Kinetic studies) – First paragraph (Batch adsorption..... spectrophotometer.) should be removed. It is just repetition from section 2.4. Cite references for the kinetic models.</p> <p>Page 7 (Section 3.1.2. FTIR) - Does any of the groups (OH-Al, Si-O, Si-O-Al) play any important role in cadmium adsorption? If yes, explain it in section 3.1.2. and cite references to support the data.</p> | <p><b>Done</b></p> <p><b>Done</b></p> <p>The pH of the aqueous solution is an important parameter which controls the sorption process (Ellio tand Huang, 1981) and metal removal typically increases with increasing pH values (Leinonen, H., J. Lehto., 2001). The pH may affect the ionization degree of the sorbate and the surface property of the sorbent (Motsi, T., 2009). Chemically, the solution pH influences metal speciation. For instance, heavy metal ions may form complexes with inorganic ligands such as OH. The extent of the complex formation varies with pH, the ionic composition and the particular metal concerned. Exposure of clay surface to water causes the ionization of surface hydroxyl groups (OH-Al, Si-O, Si-O-Al). The degree of ionization depends on pH, and the acid/base reaction occurring at the hydroxyl groups may results in surface charge development (Hui, K.S al., 2005). Clays are not only influenced by pH but in turn are capable of affecting solution pH especially in batch system (Lin, C.Y., Yang, D.H., 2002) and clays tend to have a higher internal pH. In addition, the clay surface may be influenced by the ambient pH which is not equal to the external solution pH value and precipitation within the channels of clay and at the surface of clay may occur. The effect of the solution pH on the removal of Cd<sup>2+</sup> ions by clay was examined. Based on the solubility product of metal hydroxides (Covarrubias, C., R et al., 2005) the pH of precipitation at the tested concentration was plotted as illustrated in Fig.6, the pH values were varied from 2 to 12 through this experiment. The maximum adsorption for Cd<sup>2+</sup> was found at pH of 6.7. It is clear from the presented figure that the removal of metal ions is a pH dependent process. The adsorption mechanism on clay surfaces reflected the nature of the physicochemical interaction of the metal ions in solution and the active sites of clay (Misaelides, P., 2011). The low acidity (pH bellow 4) may</p> |



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Page 10 (Fig. 5 Title) – “..... (conditions: carbon concentration, 0.2g/50mL).” Where does this “carbon” come from? Do the authors mean “adsorbent”? Also include the pH for this experiment.  
Page 10 (Section 3.3.) – Line 5 – “Below pH 5.7, the....”. It should be “6.7” as the  $pH_{pzc}$  is 6.7. Also include the details of method for point of zero charge measurement in the Section 2.

Page 11 (Figure 6) – Why the Q(mg/g) values are so high in Fig. 6 as compared to Fig.5? Review the data again.  
Page 11 (Section 3.3) – The text in this section needs to be improved.

Page 12 (Figure 7) – This figure should either be deleted or the non-linear adsorption isotherm equations should be fit into this data.  
Page 14 (Section 3.4) – Cite the references for the kinetic models. The text in this section needs to be improved.

Page 16 (Section 3.5, Fig. 12) – How were rate constants calculated? Show the model fit in Fig. 12.  
Pages 17-19 (References) – The references must be formatted according to the journal guidelines.

Follow some good articles on adsorption to improve your paper– e.g.  
Boparai HK, Joseph M, O'Carroll DM (2011) Kinetics and thermodynamics of cadmium ion removal by adsorption onto nanozerovalent iron particles. Journal of Hazardous Materials 186:458-465.  
Adebowale KO, Unuabonah EI, Olu-Owolabi BI (2008) Kinetic and thermodynamic aspects of the adsorption of  $Pb^{2+}$  and  $Cd^{2+}$  ions on tripolyphosphate-modified kaolinite clay. Chemical Engineering Journal 136:99-107. DOI 10.1016/j.cej.2007.03.012

collapse clay structure, especially that with low Si/Al ratio, but the destruction will be more at pH below 3. Biskup and Subotic 2004, stated that pH below 4.5 is not recommended for clay. Therefore, the decrease in removal capacity at low pH can be attributed to the collapse of clay structure. Out of these reasons and depending on the results of Fig. 6 an optimum pH of 6.7 was suggested to carry out the adsorption experiments.

**Clay only**

The pH at the potential of zero charge of the clay was measured using the pH drift method. The pH of the solution was adjusted by using 0.01 M sodium hydroxide or hydrochloric acid. Nitrogen was



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|  | <p>bubbled through the solution at 250C to remove the dissolved carbon dioxide. Activated carbon 50 mg was added to 50 ml of the solution. After stabilization, the final pH was recorded. The graphs of final pH versus initial pH used to determine the zero point charge of the clay (Lopez-Ramon et coll., 1999).</p> <p>the Q(mg/g) values are so high in Fig. 6 as compared to Fig.5 because the adsorbent weigh is 0.2g/25 mL.)</p> <p>done</p> <p>Ho Y.S., McKay G. (2000), ‘The Kinetics of Sorption of Divalent Metal Ions onto Sphagnum Moss Peat’, <i>Water Research</i>, <b>34</b> (3), 735-742.</p> <p>The values of the rate constants obtained using linear regression by origin version 7.0</p> |
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