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Drinking Water
Engineering and Science
Discussions

Interactive comment on "Adsorption and Desorption studies of *Delonix regiapods* and leaves: Removal and recovery of Ni(II) and Cu(II) ions from aqueous solution" *by* Bolanle M. Babalola et al.

Anonymous Referee #2

Received and published: 25 March 2020

Interactive comment on: Title: Adsorption and Desorption studies of Delonix regiapods and leaves: Removal and recovery of Ni(II) and Cu(II) ions from aqueous solution Author(s): Bolanle M. Babalola et al.

General comments The manuscript presents adsorption studies of Cu(II) and Ni (II) in pods and leaves of a plant. The adsorption parameter effects of contact time, kinetics, isotherms and ionic strength are presented. Besides, experiments of desorption were performed. The approach is interesting; however, the document has to be improved in the way of presenting the information/results, comparing with other literature (newer

one) and avoiding presenting the same data in both graph and tables (for example kinetic data), the graphs quality has to be improve. It is recommended to compare with other adsorbents in terms of adsorption capacity (mg/g) and not percentage and including the initial concentrations. The aim or need of the study is not well stated, the application is only for wastewater? The conclusions both, pods and leaves, are promising ones to remove the metals or only one of the plant parts? How should the material be applied, in batch or filters? No studied about economics was performed, so better not to mentions economic aspects.

Specific comments Abstract: Line 13-14 mention that conditions such as pH, contact time, metal ions concentration and the presence of sodium ions were studied, however in the abstract only the results of kinetics is presented, the results of the others conditions should be included.

Line18-19: present the results of the isotherm data, at least the capacity in terms of mgMetal/gadsorbent and state is it is good or not in relation with others adsorbents in literature.

Introduction:

Include newer references as the newest one is from 2016. Some information about reports, monitoring or regulations of the metals in drinking and wastewater is needed, so, there will be an idea of which concentrations are of concern and should be used in the study to evaluate the adsorbents, that would justify why 100mgM/L was used in the study. Line 66-98 the removal capacity effectiveness of many adsorbents is reported, however almost no data of the capacity and initial concentrations of the metals is included, include the mg/g if that information is reported. That information gives an idea of why to go for natural adsorbents. Line 99 explain why is this research needed and why to choose this adsorbent, why to check the leaves and the pods?.

Materials and methods.

Lines 111-112 were the leaves and pods dried? Line 117 what were the concentrations used? Line 120-121 include the sodium and nitic acid concentrations tested. Line 119 instead of referencing to paper include the procedures in detail including for example: type of water used, adsorbent dosage, metal concentrations, rpm, volume of solutions, time, etc. Besides it would be better to include subitems for each experiment starting from: kinetics, pH effect, isotherms, ionic strength effect and desortion experiment. Each one explained in detail. Were the experiments performed at least in duplicate? Line 134 Equation 1 is not relevant, it is better to include after each subitem mentioned in the previous comment the corresponding equations for kinetics and isotherms. Better here than in the results and discussion section. Line 136 a specific subsection is needed for the analitycal procedure including equipment brand and model and the detection limit for both metals.

Results and discussion Lines 156-158 The diffractogram first shows that both materials are amorphous, that could be related to high surface area and potential adsorption. Besides, include in Figure 3 the diffractogram of cellulose so, that it can be directed compare, specially thinking that in natural products not only cellulose is present, what about lignin for example? DRX is not enough to characterize a natural products, other techniques like IR, MNR, etc is needed. What is found in literature for natural adsorbents of this type? Which moiety are responsible for the adsorption? Line 157 mention amino group, but in figure 2 no nitrogen was detected. Line 164-165 start with the kinetic study. Line 165 it is important to mention that in general pods performed better than leaves for both metals in the whole pH range, why? Line 176: include adsorbent dose. Line 183: what can be the precipitate? What literature says? Line 200 the equipment and time evaluated goes in the materials and methods section. Line 201 it is evident that pods are better than leaves, make a comment. Line 207 include adsorbent dose. Line 205 -228 the information in Fig. 5b and Table 1 is basically the same, let the Table 1 in the document. Line 210-213 then adsorption was mainly in 30 min, how is that compare to the literature? Faster, slower? Line 218 how Hansen et al. (2010) supports your results on kinetics? Line 221-222 needs a reference and an

explanation on how the ion exchange or sharing of electrons explains the adsorption of the metals in the adsorbent. Line 223: put the equation in materials an methods. Line 228: compares the Qe and k values obtained for the pods and the leaves among them and the literature. Line 230 this is confusing is that the same experiment for the isotherms? Then, the title item should refers to the isotherms experiments. Line 244: what is the adsorbent dose? Line 241 regarding with Fig. 6b and Fig 6c those are the linearized isotherms and the same information is on Table 2. Recommend to plot Qe vs Ce instead of those figures. Line 254 as mentioned before, including those equations in the materials and methods, include the actual isotherms equations and the linearized ones. Line 272 repeated word: correlation Line compare data of Table 2 with others adsorbents in literature. Line 296-300 the data suggest that the pods are better than the leaves, it can be seen from the graphs in Figs. 5a and 6a, from the data. Besides, 1/n and Kf are lower and higher respectively for the pods for both metals confirming that the pods perform better and adsorption is more favorable on them at the concentrations studied. Line 300-304 higher R2 only confirms which data fit better to the model not which one is a better or a favorable adsorption. Line 305 the adsorbent dose experiment is to determine the isotherm. Line 316 better to use normal scale, not logarithmic so the effect is easier to see. Line 331 was that experiment as all made by duplicate? The results with 0.05M HNO3? Are confusing, how is that the Ni and Cu pods % is substantially lower and with ultra pure water and higher concentration is practically the same in both cases? How to explain that? Line 349-351 what implications has those results in the application of those materials as adsorbents. Line 352-352 what can be concluded from the isotherm data? Are those good or not for the removal of the metals, are them better than others? Line 354/355 what to conclude from the kinetic, is it fast or lower than others? Line 355/356 see comment on line 331, confusing data. Line 357-359 no economical study was done, so can't conclude that. Besides only two metals were evaluated and using ultrapure water, so can't conclude is application in natural conditions and besides, can't conclude about others environmental contaminants.

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