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Reply to Comments on “Low-cost chitosan-calcite adsorbent development for potential phosphate removal and recovery from wastewater effluent” by Pap et al.
[Water research 173 (2020) 115573]

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Notes: The authors declare no competing financial interests

Abstract

This letter is in response to the comments of Dr Hu and Dr Zhang on “*Low-cost chitosan-calcite adsorbent development for potential phosphate removal and recovery from wastewater effluent*”. We thank Dr Hu and Dr Zhang for their interest and comments, and having reflected, we wish to provide some clarification.

Keywords: Adsorption; Kinetics; Isotherm; Bohart-Adams model; Curve characteristics

1. Correction of curve fitting results

We agree that the model parameters obtained using Origin software and the Levenberg–Marquardt method are slightly different from those we reported. We used Excel, which clearly produced some insignificant divergence in the calculated data (Pap et al., 2020). However, we feel that there is limited difference in the key constants and error values generated, and moreover, the thermodynamic data (e.g., ΔH was 88.66 and is now 63.71 kJ/mol) remain similar. Therefore, no changes are considered necessary to our concluding remarks (also see Supplementary Information which compares previous and updated data).

2. Bohart–Adams model

The authors thank Dr Hu and Dr Zhang for their insightful comments regarding the different versions of the Bohart-Adams model (exponential vs logistic given by Eqs. (1) and (2) in their Comment). Indeed, we were not familiar with the logistic version at the time the article was prepared, and as such, we used the exponential version, which is able to track breakthrough data up to about $C < 0.3C_0$ breakthrough (Ang et al., 2020; Chu, 2020). One of our main goals was to design a column adsorption system to remove P from wastewater at low concentrations. Therefore, the model may (in practice), be largely

irrelevant when we have a breakthrough of >20-30%, as the adsorbent bed would need replacing (Ang et al., 2020).

3. Use of Clark model

The authors agree that to use the Clark model, the adsorption system should ideally follow Freundlich. However, since the Freundlich equation was approximately valid, the Clark model was considered suitable for the approximation of a packed bed column system (Han et al., 2009; Rout et al., 2017; Wan Ngah et al., 2012). However, we agree that in future it would be better to correlate the experimental data with the Clark model as a three-parameter empirical model. See Supplementary Information for the refitted data (Figure S1c-e).

4. Partial and complete data

We would agree that using model fitting on a partial breakthrough curve can affect model parameters, however, this approach is common (Han et al., 2008; Lim and Aris, 2014; Zheng et al., 2019). It should be noted that the model parameters were not used for further calculations, or, to draw significant key conclusions. The authors will consider this constructive criticism in future studies.

5. Conclusions

We thank the authors of “*Comment on "Low-cost chitosan-calcite adsorbent development for potential phosphate removal and recovery from wastewater effluent" by Pap et al. [Water research 173 (2020) 115573]*” for drawing out the above points for clarification. We believe such contributions avoid the propagation of errors within the literature and help improve the robustness of papers published in the field of adsorption.

58 **Conflict of interest**

59 The authors declare that they have no known competing financial interests or personal
60 relationships that could have appeared to influence the work reported in this paper.

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