

Accepted Manuscript

Insights and pitfalls of artificial neural network modeling of competitive multi-metallic adsorption data

D.I. Mendoza-Castillo, H.E. Reynel-Ávila, F.J. Sánchez-Ruiz, R. Trejo-Valencia, J.E. Jaime-Leal, A. Bonilla-Petriciolet



PII: S0167-7322(17)34526-9
DOI: doi:[10.1016/j.molliq.2017.12.030](https://doi.org/10.1016/j.molliq.2017.12.030)
Reference: MOLLIQ 8326

To appear in: *Journal of Molecular Liquids*

Received date: 26 September 2017

Revised date: 30 November 2017

Accepted date: 6 December 2017

Please cite this article as: D.I. Mendoza-Castillo, H.E. Reynel-Ávila, F.J. Sánchez-Ruiz, R. Trejo-Valencia, J.E. Jaime-Leal, A. Bonilla-Petriciolet, Insights and pitfalls of artificial neural network modeling of competitive multi-metallic adsorption data. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi:[10.1016/j.molliq.2017.12.030](https://doi.org/10.1016/j.molliq.2017.12.030)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

INSIGHTS AND PITFALLS OF ARTIFICIAL NEURAL NETWORK MODELING OF COMPETITIVE MULTI-METALLIC ADSORPTION DATA

D.I. Mendoza-Castillo ^{1,2}, H.E. Reynel-Ávila ^{1,2}, F.J. Sánchez-Ruiz ³, R. Trejo-Valencia ⁴, J.E.

Jaime-Leal ¹, A. Bonilla-Petriciolet ^{1*}

¹ Instituto Tecnológico de Aguascalientes, Aguascalientes, 20256, México

² CONACYT, Cátedras Jóvenes Investigadores, 03940, México

³ Centro de Investigación y Desarrollo Tecnológico en Electroquímica, Querétaro, 76703, México

⁴ Instituto Tecnológico de Minatitlán, Veracruz, 96848, México

ABSTRACT: This manuscript discusses the advantages and limitations of ANNs models for modeling and predicting multi-component adsorption of heavy metal ions on bone char. In particular, the simultaneous adsorption of cadmium, nickel, zinc and copper ions in binary, ternary and quaternary mixtures on bone char has been used as a case study to analyze the problems associated with the training variables, activation function and architecture used in the ANNs modeling of multi-metallic adsorption data. The results of this study demonstrated that a proper ANNs training variable was fundamental for a reliable fitting and for the prediction of the complex adsorption behavior of metallic mixtures. In particular, the use of equilibrium concentrations as output data for the training of ANNs model may cause incorrect predictions of the multi-metallic adsorption on bone char. These pitfalls of ANNs models could prevail for multi-component systems with an antagonistic adsorption if extensive variables, such as equilibrium concentrations or removal percentages, were used in the training stage. These findings are valuable and can be used as guidelines for the application of ANNs models in the simulation and prediction of multi-component adsorption systems involved in water treatment and purification.

Keywords: Artificial neural networks, Adsorption, Heavy metals, Water Treatment, Modeling

* Corresponding author: (52)4499105002 ext. 127, petriciolet@hotmail.com

Download English Version:

<https://daneshyari.com/en/article/7843211>

Download Persian Version:

<https://daneshyari.com/article/7843211>

[Daneshyari.com](https://daneshyari.com)