



J. Serb. Chem. Soc. 83 (3) 391–393 (2018)
JSCS–5082

LETTER TO THE EDITOR

Comments on the article entitled *Adsorption of strontium on different sodium-enriched bentonites* by Sonja R. Marinović, Marija J. Ajduković, Nataša P. Jović-Jovičić, Tihana M. Mudrinić, Bojana N. Nedić-Vasiljević, Predrag T. Banković and Aleksandra D. Milutinović-Nikolić, published in the *Journal of the Serbian Chemical Society*, Volume 82, Issue 4, 2017, pp. 449–463

SLOBODAN K. MILONJIĆ*#

Vinča Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia

(Received 16 December 2017, accepted 15 January 2018)

Abstract. Recently, Marinović *et al.*¹ have presented a study on the adsorption of strontium on different sodium-enriched bentonites. However, some experimental procedures and methods used, as well as presentation and interpretation of some data, are questionable, *i.e.*, erroneous.

Keywords: adsorption; bentonites; problematic interpretation.

Recently, I have read the article of Marinović *et al.*¹ on the adsorption of strontium on different sodium-enriched bentonites with great interest. But, it seems to me that a few scientific questions about the presentation and interpretation of some experimental data have to be raised.

In EXPERIMENTAL, *Adsorption experiments*, the authors wrote that the amount of Sr²⁺ adsorbed, q_t (mg g⁻¹), after time t was calculated from the following mass balance relationship (Eq. (1)):¹

$$q_t = \frac{c_0 - c_t}{m_{\text{ads}}} \quad (1)$$

where c_0 and c_t are the concentration (mg dm⁻³) of Sr²⁺ in the initial solution and after adsorption time t , respectively.

* E-mail: smiloni@vinca.rs

Serbian Chemical Society member.

<https://doi.org/10.2298/JSC171216017M>

The expression of Eq. (1), however, is incorrect. According to this equation, the obtained/resulting q_t values have the unit $\text{mg g}^{-1} \text{dm}^{-3}$. Equation (1) should be correctly expressed as Eq. (2):

$$q_t = \frac{(c_0 - c_t)V}{m_{\text{ads}}} \quad (2)$$

where V is the volume of solution (dm^3) in authors' case, 0.050 dm^3 . Therefore, the q_t values calculated according to Eq. (1) are incorrect. The q values plotted on the y -axis of Figs. 3–7 and given in Tables II and III¹ are also incorrect. Therefore, the values obtained from these data, as well as the discussions related to the adsorption of Sr^{2+} on different sodium-enriched bentonites are invalid, and consequently re-calculation of all parameters is strongly recommended.

From Fig. 4,¹ it is evident that the adsorbed amounts of Sr^{2+} on Na-T, Na-W and Na-B bentonites in the initial pH_i range ~ 4 to ~ 9 are constant, because the final pH_f values are constant. Please note that the adsorbed amount depends on the equilibrium solution pH , *i.e.*, pH_f .

On pages 457 and 459,¹ the authors wrote: “This indicates that the ion exchange mechanism was the dominant adsorption mechanism” and “As previously stated, the ion exchange mechanism could be regarded as the dominant adsorption mechanism”, respectively, giving however no experimental proof for such a statement. In the case of ion exchange, the amount of sorbed cation(s) from a solution (in this case Sr^{2+}) should be equivalent to the amount of released cation(s) from the sorbent (in this case Na^+ , and other cations present in the investigated bentonites).

In Fig. 5,¹ the authors illustrate the effect of the contact time on the adsorption of Sr^{2+} on three studied bentonites. It is evident that the adsorption equilibrium for Na-B and Na-T bentonites was reached within 20–25 min. However, in Fig. 6,¹ they show linear plots for the pseudo-second-order kinetics. The use of data recorded after the reached equilibrium (in this case after 25 min), or very close to the equilibrium, for a significant interval of time is likely to lead to erroneous conclusions in the adsorption kinetics analysis. The measurements of the adsorption of Sr^{2+} on the studied bentonites should be started at an initial time shorter than 10 min.

The dimension of the Freundlich adsorption constant given in Table II, as K_f in $\text{dm}^3 \text{mg}^{-1}$, is incorrect. The correct dimension is $(\text{mg g}^{-1})/(\text{mg dm}^{-3})^n$. The values for the energy of adsorption (E) according to the Dubinin–Raduskevich isotherm model are given in Table III. On the basis of the calculated E values the authors wrote: “The calculated E values were similar for all investigated adsorbents and slightly higher than 8 kJ mol^{-1} , indicating that the type of adsorption was chemisorption.” In the same table, the authors gave the Freundlich adsorption constant (n) data, from 5.78 to 9.558, for all investigated bentonites.

Based on this ($n > 1$), it means that the adsorption process is physical. It is evident that the given data, and the conclusion drawn from them, are in disagreement.

Finally, all the results and discussions related to the adsorption of Sr^{2+} on studied bentonites, as well as drawn conclusions are highly questionable.

I hope that these comments, intended to prevent future mistakes, will be of assistance not only to the authors of commented paper¹ but also to others working in this field.

To conclude, I suggest the authors of the paper,¹ as well as other researchers and reviewers working in the field of adsorption/sorption from solutions, to read the paper (A critical review) of Tran *et al.*² devoted to mistakes and inconsistencies regarding the adsorption of contaminants from aqueous solutions.

ИЗВОД

КОМЕНТАРИ НА РАД ПОД НАСЛОВОМ АДСОРПЦИЈА СТРОНЦИЈУМА НА РАЗЛИЧИТИМ НАТРИЈУМОМ ИЗМЕЊЕНИМ БЕНТОНИТИМА, АУТОРИ: САЊА МАРИНОВИЋ, МАРИЈА АЈДУКОВИЋ, НАТАША ЈОВИЋ-ЈОВИЧИЋ, ПРЕДРАГ БРАНКОВИЋ, ТИХАНА МУДРИНИЋ, БОЈАНА НЕДИЋ-ВАСИЉЕВИЋ И АЛЕКСАНДРА МИЛУТИНОВИЋ-НИКОЛИЋ, ОБЈАВЉЕНОГ У *JOURNAL OF THE SERBIAN CHEMICAL SOCIETY*, VOLUME 82, ISSUE 4, 2017, СТР. 449–463

СЛОБОДАН К. МИЛОЊИЋ

Институт за нуклеарне науке "Винча", Универзитет у Београду, Београд

Недавно је у *Journal of the Serbian Chemical Society* објављен рад (JSCS 82(2017)449–463) под насловом "Адсорпција стронцијума на различитим натријумом измењеним бентонитима", чији су аутори Сања Мариновић, Марија Ајдуковић, Наташа Јовић-Јовичић, Предраг Банковић, Тихана Мудринић, Бојана Недић Васиљевић и Александра Милутиновић-Николић. Циљ ових добронамерних коментара је био да се укаже на: погрешно израчунавање појединих величина, грешке у интерпретацији добијених/израчунатих резултата као и грешке изнете у закључцима рада. Аутор ових коментара верује да ће изнети коментари бити од користи не само ауторима предметног рада већ и осталим ауторима и рецензентима који раде у области адсорпције/сорпције из раствора.

(Примљено 16. децембра 2017, прихваћено 15. јануара 2018)

REFERENCES

1. S. R. Marinović, M. J. Ajduković, N. P. Jović-Jovičić, T. M. Mudrinić, B. M. Nedić-Vasiljević, P. T. Branković, A. D. Milutinović-Nikolić, *J. Serb. Chem Soc.* **82** (2017) 449
2. H. N. Tran, S.-J. You, A. Hosseini-Bandegharai, H.-P. Chao, *Water Res.* **120** (2017) 88.