**Response to the Reviewer’s comments**

The authors thanks the Reviewer for 3rd reviewing of the paper.

**Response to General comments:**

Regarding the Reviewer’s comments: “Authors didn't find any difference in the sorption in single/mixed systems in equilibrium (Fig.4) and yet they are discussing as there was a difference, based on the calculated values that I do not understand (no reference provided for the newly introduced equation 5, not all parameters in equation identified)”.

We would like to mention that the adsorption behavior of surfactant mixtures can be very different depending on the chemical nature of the surfactant and sorbent, the surfactants concentration and their ratio in the mixture. For example, Zhou and Rosen [32], Schwuger and Smolka [33] showed that at low concentrations the adsorption values of ionic surfactants from their mixtures with non-ionic surfactants at polyethylene and activated carbon surfaces, respectively, are higher than adsorption of ionic surfactants from their individual solutions. Zhang et al. [J. Colloid Interface Sci. 2006, 302, 20] showed that the adsorption of cationic dodecyltrimethylammonium bromide (DTAB) at silica might be higher (at low concentrations), lower (at intermediate concentrations) or almost equal (at adsorption saturation) compare to adsorption of the mixture of DTAB with non-ionic dodecyl-β-D-maltoside.

In this study the difference in HDPB adsorption from its individual solutions and HDPB/Triton X mixtures was found at low solution concentrations and this was mentioned in the text related to Fig. 4. At the same time, taking into account the Reviewer's remark regarding Fig. 4, we agree the further studies, including the use of other experimental methods, are needed to have better insight into the adsorption data at adsorption saturation. Therefore, Fig. 4 has been removed from the article. In the revised text the appropriate clarification related to the studied concentration range was added as follows “As seen... in the studied concentration region..." (page 9) . Also both in the abstract and conclusions we highlighted that the dependency was found “at low surfactant concentrations”.

Regarding the Reviewer’s comment on equation 5, we do confirm that the equation 5 is taken from reference 32 (cf. the equation in second paragraph, left column on page 7303). Taking into account the Reviewer’s comment the meaning of *Acalc*parameter has been specified in the description to equation 5, though from the text related to equation 5 (last paragraph on page 8) as well as from description of parameter *A* in equation 1 (page 4) it might be seen that *Acalc* is a calculated value of total ideal adsorption from the surfactant mixtures.

Overall, in our opinion the experimentally obtained data are sufficiently discussed, and the discussion is supported by appropriate references available in the literature.

**Response to the Reviewer’s comments in the text:**

Abstract

* Regarding the Reviewer comment: why the experimental values of total surfactants adsorption from the mixtures are higher than the calculated ones for the ideal surfactant mixtures? We would like to mention that the explanation has been already provided in the text (pages 9 and 10 )
* Regarding the Reviewer’s comment on repeating of the highlighted sentence with the second sentence in the abstract we would like to mention that the second sentence is related to the individual surfactant solution while the highlighted sentence is related to HDPB/Triton X mixtures and the mixed adsorption layer

Materials and methods

* Taking into account the Reviewer’s comments the phrase “was extracted” was changed for “was washed”, “Schimadzu” changed for “Shimadzu” and reference [27 ] for Smoluchowki equation added to the paper
* Taking into account the Reviewer’s comment on CMC evaluation, the relevant reference [26, page 176 ] also added to the text

Results and discussions

* Regarding the Reviewer's comment: “Why there is only difference below saturation?” As was mentioned above, further studies are need to have better insight into the data at adsorption saturation. However it might be assumed that incorporation of the molecules of the counterpart surfactant in the mixed adsorption layer might lead to decreasing in electrostatic repulsion between the HDPB ions, as well as to reducing in steric repulsion between the Triton X molecules. These effects might brings the surfactants molecules closer to each other thus increasing adsorption at low solution concentrations (below saturation). It might be assumed that at adsorption saturation the surfactants molecules are tightly packed in the adsorption layer so there is no available free space at the surface to accommodate more adsorbed molecules.
* Regarding the Reviewer's questions on concentration range used in references [32] and [33]

Yes, the described effects were reported at low solutions concentrations (cf. Fig. 6 on page 7959 in [32] and Fig. 4 on page 592 in [33])

* Regarding the Reviewer comment on equation 5, we would like to confirm that the equation 5 was taken from reference 32 (cf. the equation in second paragraph, left column on page 7303). Taking into account the Reviewer's remark, the meaning of *Acalc* parameter, which is a calculated value of total ideal adsorption from the surfactant mixture, was specified in description to equation 5.
* Regarding the Reviewer comment on Triton X and *Ce* in Figure 5, we would like to mention that adsorption data for Triton X are presented to clearly see the difference in adsorption of individual surfactants and their mixtures. *Ce* is equilibrium surfactant concentration as it can be seen in equation (1) on page 4.
* Regarding the Reviewer's question on correlation between composition of the mixed adsorption layer and zeta potential values of CB particles. We meant that changes in zeta potential values of CB particles in the surfactant mixtures reflect the molar composition of the mixed HDPB/Triton X adsorption layer. However, taking into account the Reviewer’s comment and to avoid any uncertainty, the text on page 13 was changed from “As seen in Fig. 7, the composition of the mixed adsorption layers correlates with the change of zeta potential..” to “As seen in Fig. 6, the positive zeta potential value of +46 mV of CB particles in the single HDPB solution decreases in the mixed solutions in the presence of the non-ionic surfactants”. HDPB concentration in the system was 4x10-5×2×10-4 mol/L depending on HDPB molar fraction in the surfactant mixture.

Conclusions

* Taking into account the Reviewer’s comment and to avoid any uncertainty we highlighted that the dependency was found “at low surfactant concentrations”.

Additionally, the numbering of the figures and references was updated.

Hope the provided changes and explanations are satisfactory.

We would like to ask the Reviewer to accept those and give the green light to this paper.

Best regards,

Olga Kochkodan