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Chemistry and Biochemistry Department

Solution-based study of the clay-surfactant-microplastic interactions

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Abstract

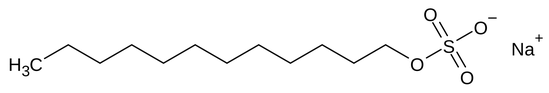
Since the end of the 20th century, plastic pollution has reached even the most remote locations of our planet; today, plastics litter can be found in the atmosphere, hydrosphere, and lithosphere. Consequently, plenty of efforts has focused on this problem making it a hot topic of research, particularly plastic found in the hydrosphere. Regarding the lithosphere, the fate of *microplastics* -plastic pieces of less than 5 mm- in soil has recently gotten more deserved attention; nonetheless and to the best of our knowledge, less efforts have pursued the interactions between clay particles -a main component of soil- and microplastics. In this poster, we present a systematic analysis of such interactions using analytical techniques such as dynamic light scattering, solution conductivity and pH.

Methods

The first step taken to analyze clay-surfactant-microplastic Interactions was filtration. Using a Kimax funnel, Fisherbrand P8 filter paper (pore size of 20-25 μm), vacuum filtration was used to filter 5 grams of Kaolinite clay mixed with 500 mL of Deionized water.

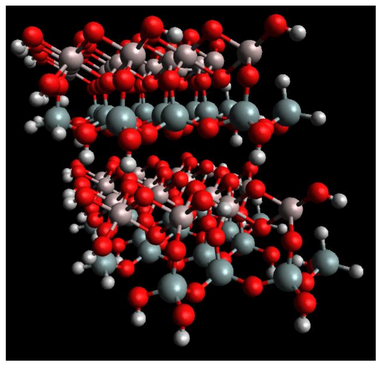
Surface-Interactions

- 5 mL of the filtrate was then used for titration with surfactant Sodium Dodecyl Sulfate (SDS) 8.0 μM. A baseline titration was done first with just water and SDS.

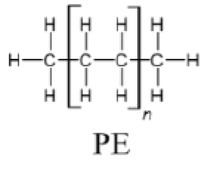


Sodium dodecylsulfate SDS

- 5 mL of the filtrate kaolinite was titrated with SDS.



- 5 mL of the filtrate along with 0.105 grams of Clear Polyethylene Microspheres (CPMS) was titrated with SDS.



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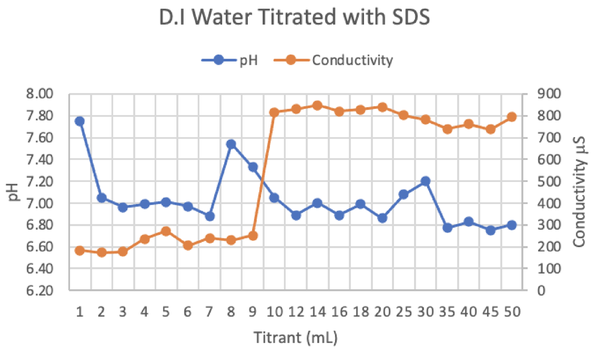
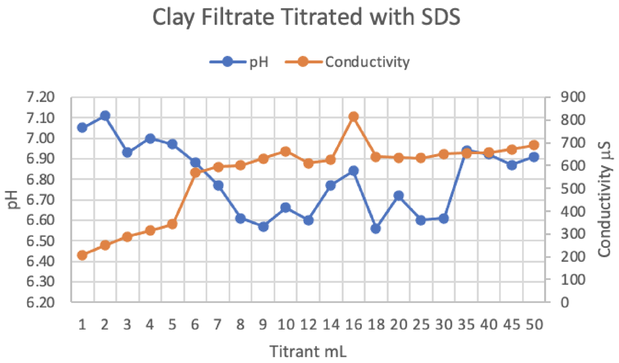
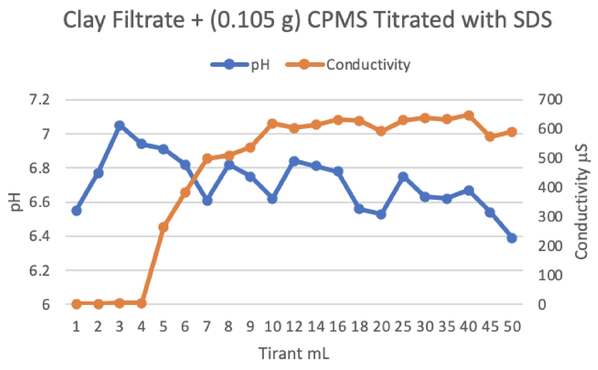
- During all three titrations the solution pH and Conductivity were taken repeatedly using the Accumet excel XL50 and the Oaklon CON 700.

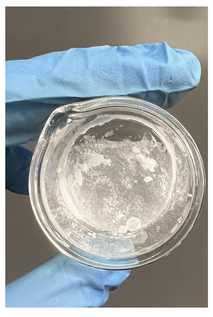
Results

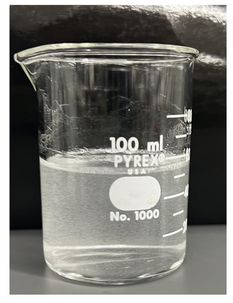
The conductivity or the titrands having kaolinite and the mixture kaolinite-microplasitcs show very different behaviors when compared with the water baseline. This suggest that there are interactions between the three species present. The pH did not show any significant change.











Conclusion

The results in this study showed that the surface interactions between microplastic spheres and clay particles of less than 25 μm in size can be affected by the presence of a surfactant.

Acknowledgements

- Division of Chemistry and Biochemistry

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References

- Gregory Reimonn, Taofeng Lu, Neeti Gandhi, and Wan-Ting Chen. "Review of Microplastic Pollution in the Environment and Emerging Recycling Solutions." Environmental Chemistry JRM, 2019,vol 7, no. 12