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The behavior of nitrogen soluble forms in natural water in the presence of anionic and cationic surface-active substances and of mineral substrates

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Solid mineral substrates of different nature and dimensions come into contact and interact with the organic substances present in the surface water basins. We studied the influence of the solid granules size of the substrate as well as of the composition of the organic and inorganic water components on the adsorption of organic substances on the substrate surface, on the water basins organic substances accumulation, on the natural water components equilibrium, and on the natural water oxidation-reduction processes. Laboratory simulations were carried out in the water of the Isnovat River (the affluent of the Bac River, which is a tributary of the Nistru River). The model natural water samples containing lauryl sulfate as anionic surface-active substance (SAS An) and cetyltrimethylammonium as cationic surface-active substance (SAS Ct), separately and in a body, as well as the substrates $\text{Al}(\text{OH})_3$, Al_2O_3 , CaCO_3 , H_2SiO_3 , light fraction (clayey) of diatomite and expanded clay powder have been studied. The analysis of the behavior of the soluble nitrogen compounds (NH_4^+ , NO_2^- , NO_3^-) in the samples of natural water has been performed. The effect of the presence of lauryl sulfate has been found to be a fixation and a passivity of the properties of a part of the river water organic matter due to the redox processes brake. The inactivation effect of this part is more effective if compared to the activity of the sample containing both CaCO_3 and the anionic SAS, as in the case of ammonium oxidation. This proves that calcium carbonate powder has an environmental improvement effect for oxidation of the nitrite ion. Oxidation of the nitrite ion as an intermediate step also demonstrates that, indeed, CaCO_3 facilitates the redox process by better fixation and sedimentation of the organic component in the laboratory simulations. Moreover, we have shown that CaCO_3 is the cause of the best cationic separation/inactivation in the presence of both anionic and cationic SASs (including the type with only SAS Ct). The decreasing impact of water self-purification improvement in the rivers water in the series of following substrates (CaCO_3 , $\text{Al}(\text{OH})_3$, Al_2O_3 , H_2SiO_3 , light fraction (clayey) of diatomite, expanded clay powder) has been observed. The sensitivity of the environment to substrate activity modifications is most likely dependent on the nanoparticle size of its granules. An increase in the particle size lead to the reducing of the braking of the self-purification processes during the accumulation of the harmful organic component on their surface, and vice versa, a decrease in the particle size lead to the developing of the braking effect of the redox activity of the nitrogen forms in the river water.

Biography

Francisco Fernandez began his career at Hostos as an adjunct professor in 1992. Then in 2000, he began teaching General Chemistry and Environmental Science courses full time. He said his "worldly" experiences as both a student and a professor have served him well at Hostos and he incorporates that knowledge into his coursework. In past semesters, his students were involved with the analysis of heavy metals contaminating the Harlem River. Currently, plans are underway to work with the Harlem River Project on site remediation and control of environmental issues affecting this part of the Bronx. He has over 25 publications in referred scientific journals, and is the coauthor of a *Physical Chemistry* textbook that was published in Cuba in 1988.

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