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Development of nanocellulose for studies of iron speciation in aquatic systems

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Cellulose is a natural abundant material advising of renewable and sustainable resources. This material and intense research subject but how will this material behave in aquatic systems? The synthesis route was development of cellulose in a reduced scale starting from the bleached pulp from the extraction of the wood by kraft process. A particulate concentration measured by analysis of zeta potential. The concentration of the particles was measured by Nanoparticles Tracking Analysis (NTA-Malvern®). The Figure 1 presented the relationship between concentration and particle size of sample for conditions using 3.0 g cellulose pulp, 20 minutes sonication and 450 nm membrane filtration.



Figure 1 - Relationship between concentration and particle size of sample.

The particles were obtained on a nanoscale and can be applied in environmental studies. Nanocellulose were added in solution containing complexes of the iron and Aquatic Humic Substances (Fe-AHS). By ultrafiltration system and determination in atomic absorption spectrometry was made the speciation of metallic species in the presence of organic matter in the form of humic substances and subsequent addition of nanoparticles. The iron total concentration (Fetotal) in the solution 1.70 mg.L-1. After 24 hours 0.29 mg.L-1 of free iron in solution (Fefree) and 1.41 mg.L-1 of complexed iron with humic substances (Fe-SHA) were determined. After 24 hours of the addition of the nanoparticles to this solution the free metal concentration increased to 0.85 mg.L-1 (Fefree). Before addition of nanocellulose more than 80% of the ions are complexed to the AHS. The kinetics of the reaction were evaluated as a function of time. It also presents the concentration of iron complexed for a period of 24 hours in the presence of nanocellulose showing its influence on the SHA-Metal complexes. In the first minutes after the addition of nanocellulose, a concentration of iron complexed with SHA occurs the ions originally complexed to SHA may be available in solution. This result indicates that there is interaction between the nanoparticle and the humic substance.

Recent Publications

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Biography

Post-doctorate in Chemistry, PhD and Master in Analytical Chemistry by the Institute of Chemistry of the São Paulo State University - UNESP, graduated in Chemistry from the State University of Maringá. She is currently Assistant Professor of the Production Engineering Course at Campus Itapeva at the UNESP. Has experience abroad, through internships in the Netherlands (University of Wageningen) and in Portugal (University of Algarve) in collaboration with professors Herman H. P. van Leewen and José Paulo Pinheiro. Professor accredited in the Post-Graduate Program in Engineering of Biomaterials and Bioprocesses of the Faculty of Pharmaceutical Sciences of UNESP of Araraquara-SP. Since 2014 it is leader of the Research Group: Energy, Pulp and Environment. He works in Analytical Chemistry, with emphasis on Trace Analysis and Environmental Chemistry. She has published 28 articles in leading magazines.

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