

Analytical, Environmental and Geo- Chemistry

has the honor to invite you to the public defense of the PhD thesis of

Hailong ZHANG

to obtain the degree of Doctor of Sciences

Joint PhD with Université Libre de Bruxelles

Title of the PhD thesis:

Phosphorus sorption dynamics in the Scheldt Estuary

Promotors:

Prof. dr. Lei Chou (promotor, ULB)
Prof. dr. ir. Marc Elskens (promotor, VUB)

The public will take place on

19 December 2019 at 10h

in Forum F at the Campus Plaine, Université libre de Bruxelles, Boulevard du Triomphe 2 - 1050 Brussels, and will be followed by a reception.

Members of the jury:

Prof. dr. Yue Gao (chairman, VUB)
Prof. dr. Steeve Bonneville (secretary, ULB)
Prof. dr. Pierre Régner (co-promotor, ULB)
Prof. Em. Steven Eisenreich (VUB)
Prof. dr. Jan Diels (KUL)
Prof. dr. Gabriel Billon (Univ. de Lilles 1)

Curriculum vitae

Hailong Zhang was born in Linfen city, Shanxi province of China on July 25th, 1989. He obtained the degree of Master of Environmental Sciences in 2015 at Guangzhou University of China and worked one year in South China Institute of Environmental Sciences after his Master's study. For his PhD research, he is interested in the study of phosphorus sorption dynamics during estuarine mixing. As first author, he has published one paper on this subject in the journal of *Chemosphere* and will submit two other papers later.

Abstract of the PhD research

Eutrophication is a major environmental issue and is generated by excessive inputs of anthropogenic nutrients, such as nitrogen and phosphorus. Hydrous ferric oxide (HFO) is ubiquitous in natural waters and regulates the phosphate bioavailability, especially in estuarine systems characterized by brackish environments. This thesis investigates the effects of pH, salinity and the presence of major seawater ions on phosphate sorption dynamics using synthesized HFO particles and sediments obtained from the Scheldt estuary.

The phosphate adsorption capacity on HFO particles increases with increasing salinity and decreasing pH. Phosphate adsorption on HFO is due to the inner-sphere complexation. The promotion of phosphate adsorption on HFO with the presence of main seawater ions can be attributed to the electrostatic interaction. No evidence of the formation of phosphate-bridged ternary complexes has been found during this adsorption process. In the Scheldt estuary, more than half of the total phosphorus (TP) in the sampled sediments are potentially bioavailable. Sediment can switch from acting as a sink of P to being a source of P with the enhancement of pH and salinity.

Overall, the present study indicates that variations of pH and salinity have a great influence on phosphate sorption dynamics in the Scheldt Estuary and the general trend is applicable to other estuaries.