Natural Zeolites and Clay Minerals as Effective Adsorbents for Removal of Nutrients (P) From Eutrophic Water: Challenges and Opportunities

***Hossein Kazemian*[1,2,3]**
(Faculty and Head of the NALS at UNBC)

[1] *Materials Technology & Environmental Research Lab (MATTER), University of Northern British Columbia (UNBC), Prince George, BC, Canada.*

[2] *Northern Analytical Laboratory Services (NALS), University of Northern British Columbia (UNBC), Prince George, BC, Canada.*

[3]*Chemistry Department, Faculty of Science and Engineering, University of Northern British Columbia,*

E-mail: Hossein.kazemian@unbc.ca

Abstract:

Phosphorous "P" is an essential element and often limiting nutrient for biological organisms in different environments, therefore it is one of the key fertilizer constituents. The excessive discharge of "P" compounds in water bodies resulted the eutrophication problem in many lakes and surface water bodies worldwide. In eutrophic aquatic environments, induced overgrowth of phytoplankton species shifts to blue-green algae which generate many species of toxic cyanotoxins (e.g. Microcystin-LR) with fatal effects on human and animals. Additionally, eutrophication has deteriorating effects on water quality by depletion of dissolved oxygen, forming floating layers or decreasing the light transmittance and subsequently threatening aquatic life.

The elevated levels of "P" may be originated from different natural or anthropogenic activities such as over-fertilizing of agricultural lands, municipal and industrial discharges, loading from lake sediments, weathering of rocks, soil erosion and leaching.

Therefore, the removal of "P" from aquatic ecosystems is a growing global environmental concern. There are several removal techniques including adsorption, coagulation–flocculation, electrocoagulation, electrochemical, phytoremediation, in which adsorption processes are gaining more attention due to their lower costs of adsorbents, easier operation, and simplicity of design.

Application of natural and modified minerals for nutrients removal from aquatic systems is an emerging research topic because of their properties such as large specific surface area, high adsorption capacity and accessibility due to their worldwide occurrence

In this talk, some experimental results of the MATTER research lab at the University of Northern British Columbia (UNBC) on this topic will be presented and discussed. In the past five years several Canadian natural zeolites and natural clay deposits were studied and assessed for their feasibility to be used for decontamination of phosphate-enriched waters. The effect of different physicochemical modification on phosphorous adsorption capacity has been studied. The impact of various parameters on the efficiency of the developed adsorbents including, initial concentration, contact time, pH, adsorbent dosage, and matrix effect in batch (and continuous) experiments will be presented and discussed.