Abstract No: 499 ***Climate and Environment***

VALUE ADDITION TO A WASTE MATERIAL VIA REMEDIATION OF AVAILABLE PHOSPHATE IN SIMULATED BRACKISH WATER - A DUAL WAY FORWARD

S. Malavipathirana[1, 2]*, S. Wimalasiri[3], N. Priyantha[1, 2], S. Wickramasooriya[1, 2], A. Welagedara[4] and G. Renman[4]

[1]Postgraduate Institute of Science, University of Peradeniya, Sri Lanka
[2]Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
[3]Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka
[4]Department of Land and Water Resources Engineering, Royal Institute of Technology, Sweden
**malavisarath@gmail.com*

Amongst the major nutrients; nitrogen, phosphorus and potassium, phosphorus deserve special attention as non-renewable nutrients for which alternatives have not been identified. Even though world's phosphorus is expected to be sufficient for another 345 years, it is seemingly being advanced to the next 50 to 100 years at the rate of present consumption thereby phosphorus would end up earlier than predicted. Further, nutrient loading caused by the excess use of nutrients (*eg.* as fertilizers) is a result of the waste rich in nutrients. Moreover, phosphorus is the major perpetrator of the eutrophication when present in excess. Consequently, recovery of phosphorus from the waste and its subsequent uses are the persuasion of current researchers. Nevertheless, nutrients such as phosphates (PO_4^{3-}) and nitrates (NO_3^-) are cumbersome to recover because of their inherent preferential characteristic to remain in aqueous phase rather than being adsorbed on solid matrixes. The primary purpose of this research is to understand the adsorption of available PO_4^{3-} - P in simulated brackish water on a solid matrix in order to reduce the stress of phosphate loading. The solid matrix is a granulated benign construction waste material prepared by crushed autoclaved aerated concrete (CAAC) that consists of mainly SiO_2 and CaO. Upon adsorption of phosphate, CAAC is then studied as a potential source of phosphorus. Management of phosphate rich brackish water is imperative due to discharge in huge volume at aquaculture practices, specially at the time of harvesting. The experiments carried out at pH 8.00 and ambient temperature (27°C) in phosphate rich simulated brackish water confirms significantly favourable PO_4^{3-} - P adsorption being the distribution coefficient (K_D) always greater than 1, and associated with non-linear adsorption demonstrated by changing the value of K_D. The maximum removal of about 98 % from 100 mg dm^{-3} PO_4^{3-} - P solution is attributed at the K_D value of 40. Both the Langumuir and the Freundlich adsorption isotherm models stand for non-linear adsorption supported by concurrently satisfying monolayer and multilayer adsorptions. This is depicted by the regression coefficients of 0.996 and 0.995, respectively, by the linearized forms of the Langumuir and the Freundlich isotherm models. Besides, repetitive adsorption results in uptake of 12 g/kg of phosphate at 81 % efficiency, indicating promising phosphate removal characteristics of CAAC. Hence, CAAC acts as a value added material which would be a slow-released phosphorus fertilizer at exhaustion.

Financial assistance given by the National Science Foundation, Sri Lanka (RG/2011/BS/05) is acknowledged.