THE REMOVAL OF PHOSPHATE IN WATER BY ADSORPTION ON LATERITE

A PROJECT REPORT PRESENTED BY

A.M.N. WIJEKOON

to the Board of Study in Environmental Sciences of the
POSTGRADUATE INSTITUTE OF SCIENCE

in partial fulfillment of the requirement
for the award of the degree of

MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCE

of the

UNIVERSITY OF PERADENIYA
SRI LANKA
2004

ABSTRACT

The process of phosphorus enrichment in water bodies, known as eutrofication, causes severe problems in aquatic ecosystems. From the environmental point of view, the most stable valence state of phosphorus in water is phosphate (PO_4^{3-}). The use of natural substances in the treatment of polluted water is a viable alternative to expensive chemicals, especially in a developing country.

This report concerns the adsorption on laterite as a tool for removal of phosphate in polluted water. Laterite, an inexpensive material commonly available in Sri Lanka, shows excellent properties as an adsorbent. Gibbsite, $Al(OH)_3$, is the dominant mineral phase in the laterite used. The dissolved phosphates were analyzed by colorimetric vanadomolybdo-phosphate method using UV/Vis spectrophotometer.

The study indicates that ~100% phosphate can be removed by laterite when laboratory prepared phosphate solutions were used. The maximum adsorption of phosphate on laterite takes place at pH 4, after an equilibration period of 24 hours. The fitting of experimental data into Langmuir and Freundlich isotherms reveals that the removal was accomplished only by adsorption. The maximum phosphate adsorption that can take place as a monolayer is 1.65 milligrams per gram of laterite. If the phosphate molecules in the suspension are in excess with respect to surface sites of laterite the system tends to perform multilayer of adsorbate.