The Transformation of Phosphorus Species in Sediments under Aerobic and Anaerobic Environment with Various Water Salinity

Phosphorus (P) is an essential macromineral for plant growth, but the excessive application of P fertilizer lead large amount of P transported from agricultural land into rivers, lakes and oceans which is the major source of eutrophication. To prevent the further contamination, estimation of the solubility and transformation of P between agricultural land and the sea is a very important task. In this study, both sequential extraction method (SEDEX) and X-ray adsorption spectroscopy (XAS) were used to investigate the transformation of P chemical species in aerobic and anaerobic environment with various salinities to simulate the real wetland environmental. The species distribution results of SEDEX indicated that the Fe-P species would decrease and exchangeable P (Ex-P) in higher salinity treatments. On the opposite, the organic P (Org-P) and calcium bound P (Ca-P) species would increase in higher salinity treatments. It not only increased the liable P species percentage but also transfer the sediments as a potential internal pollution source of P. In addition, the ratio of Fe-P species in sediments determined by SEDEX was consistent with the linear combination fitting (LCF) results from XAS. Moreover, in the anaerobic experiment, after the Eh value decreased with increasing total dissolved P concentration which due to the reduction of the Fe^{3+} in sediments. Under the same salinity treatment, more P were released from detrital inorganic P (Detri-P) and Fe-P. The results revealed that the Fe-P species are the main source to transport the P from river to wetlands and increase dissolved P concentration. In the anaerobic environment, the P, Ca and Fe^{2+} also could be released from stable species Detri-P. The conclusions form this study could be used to perform management strategies to reduce P pollution in agriculture production and evaluate the potential internal phosphate pollution risk in the rivers and wetlands.