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水体底泥及岸边土壤有机无机复合体对磷吸附特征对比

Comparative study of adsorption characteristics of phosphorus by sediment in water and riparian soil and their organic mineral complex components

关键词：底泥 土壤 有机物无机复合体 磷 吸附

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摘要：以长春市新立城水库底泥及岸边土壤为研究对象，利用平衡吸附法研究底泥、土壤及二者有机无机复合体（砂粒、粉粒和粘粒）对磷的吸附热力学和动力学特征，并探讨底泥和土壤各级复合体对磷的吸附贡献，以期探明底泥和土壤对磷的富集规律.结果表明，底泥和土壤对磷的吸附热力学均符合Langmuir方程和Freundlich方程，且底泥对磷的理论最大吸附量约是土壤的3倍.底泥及土壤粘粒复合体对磷的吸附热力学符合Langmuir方程和Freundlich方程，粉粒及砂粒复合体对磷的吸附符合Henry方程.粘粒复合体对磷的吸附量均大于粉粒复合体，而粉粒复合体均大于砂粒复合体.底泥及土壤粘粒复合体对磷的吸附贡献约为60%，粉粒复合体对磷的吸附贡献稍大于砂粒复合体的吸附贡献.底泥、土壤及二者有机无机复合体对磷的吸附动力学符合一级动力学方程、Elovich方程和双常数方程，且均在24 h以内达到吸附平衡.研究结果表明，底泥与岸边土壤对磷的吸附具有相似的规律，且底泥及其复合体对磷的吸附能力均大于土壤，说明若磷素由于地表径流等因素由土壤进入到水体中，底泥对磷会有较强的吸附净化作用，即某种意义上底泥为河流磷素有效的“汇”.

Abstract: The sediment from Xinlicheng Reservoir and the soil on the shore of the waters were selected to be research target. The adsorption thermodynamics and kinetics characteristics of phosphorus by sediment, soil and their organic mineral complex components were investigated by using equilibrium adsorption method To identify the adsorption mechanism of phosphorus by sediment and soil. The contribution of each organic mineral complex component to phosphorus adsorption was also explored. The results indicated that phosphorus adsorption by the sediment and soil were well fitted with Langmuir and Freundlich model. The maximum adsorption capacity of sediment to phosphorus was about three times of soil. The adsorption thermodynamics of sediment and soil clay complex on phosphorus were well fitted by Langmuir equation and the Freundlich equation. The adsorption of phosphorus on silt and sand was fitted by Henry equation. The adsorption capacity of clay complex for phosphorus was greater than that of silt complex, and the adsorption capacity of silt complex for phosphorus was greater than that of sand complex. The adsorption contribution of phosphorus in soil and sediment clay complex was about 60%. The adsorption contribution of phosphorus in soil silt complex was slightly greater than that in sand complex. The adsorption dynamics of soil, sediment and their complexes were fitted by first-order kinetics equation, Elovich equation and double constant equation, and all adsorption equilibrium was reached within 24 h. The result showed that the adsorption rule of sediment for phosphorus was similar to that of the riparian soil. The phosphorus adsorption capacities on sediment and its complex were greater than that of soil. It can be concluded that sediment has great purification and adsorption effects on phosphorus from the soil into the water by surface runoff. Sediment can therefore be regarded as effective "sink" for phosphorus.

Key words: sediment soil organic mineral complex component phosphorus adsorption

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