研究报告

董世魁,赵晨,刘世梁,杨志峰,IsangeSylvie,安南南.水坝建设影响下澜沧江中游沉积物重金属形态分析及污染指数研究[J].环境科学学报,2016,36(2):466-474

水坝建设影响下澜沧江中游沉积物重金属形态分析及污染指数研究

Speciation and pollution of heavy metals in sediment from middle Lancang-Mekong River influenced by dams

关键词：重金属形态 水坝 沉积物 空间分布 污染水平

基金项目：国家科技支撑计划项目(No.2014BAK19B06);环保公益项目(No.201209029-4)

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摘要：采集了漫湾库区和大朝山库区25个采样断面的沉积物样品,每个库区均从上游到下游分为河流区、过渡区和湖泊区,研究了沉积物中As、Cd、Cr、Cu、Mn、Ni、Pb、Zn元素的含量和赋存形态差异,利用次生相与原生相分布比值法(RSP)分析重金属元素的污染水平.结果表明,各库区从上游到下游沉积物中的重金属元素和碳氮元素均呈现出增加的趋势,而沉积物的中值粒径呈现出减小的趋势.漫湾库区的As、Cd、Zn元素平均含量均高于大朝山库区;大朝山库区的Cr、Mn、Ni、Pb元素平均含量均高于漫湾库区.在重金属赋存形态中,Cd和Mn元素以可交换态和残渣态为主;Cu、Pb以有机质态和残渣态为主;其余重金属元素均以残渣态为主.沉积物中的可交换态在有机碳的络合作用下转化成有机质态.在水坝建设的影响下沉积物中细颗粒和有机质含量明显上升,重金属在细颗粒物和有机质的共同作用下蓄积于坝前的沉积物中.PSR分析结果表明,在水坝运行影响下,各库区湖泊区和过渡区的污染水平均高于河流区.其中,Cd元素所有地区处于重度污染水平;Mn和Pb大部分区域处于中度污染水平;Cu元素大部分区域处于轻度污染水平;其余元素基本无污染.

Abstract：The sediments from 25 sampling sections in Manwan reservoir and Dachaoshan reservoir were collected in this research. Each reservoir was divided into three areas including riverine area, transition area and lacustrine area. The contents and speciations of As. Cd. Cr. Cu, Mn, Ni, Pb, Zn were measured. The ratio between secondary phase and primary phase (RSP) were applied to assess the pollution level of heavy metals. From upstream to downstream in each reservoir, the contents of heavy metals increased. Compared to Dachaoshan reservoir, the sediments in Manwan reservoir were higher in contents of As, Cd and Zn, while they were lower in contents of Cr, Mn, Ni and Pb. The types of Cd and Mn are extractable fraction and residual fraction. Cu and Pb were dominated by organic fraction and residual fraction. Other heavy metals were mainly in residual fraction. The extractable fraction could be changed to organic fraction due to complexation by organic matters. According to RSP results, the pollution of heavy metals were heavier in lacustrine area and transition area than riverine area. In general, Cd was serious pollutant. Mn and Cu were moderate pollutant. Cu was mild pollutant in most areas, and other heavy metals were non-pollutants.

Key words：speciation of heavy metals dams sediments spatial distribution pollution