污水灌溉区土壤重金属的空间分布特征

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摘要 通过对北运河香河段污灌区不同深度土壤重金属 Cu、Pb、Zn、Cd 含量的监测分析,评价污灌对土壤重金属含量造成的影响。结果表明,土壤中重金属含量和土壤理化性质、土壤深度以及污灌时间、污灌水重金属含量直接相关。

关键词 污水灌溉 重金属

河北省香河县与北京市接壤,北运河流经该县 20.4 km,流域面积为237.5 km^2,沿岸地区农田以北运河水进行灌溉已有 30 多年的历史[1],灌溉量达到 670 m^3/hm^2,由于水质污染造成了沿岸地区农田污灌的现象[2]。

土壤重金属的累积是长期的过程,进入土壤后的重金属难被微生物降解、不易迁移,进入土壤环境的重金属元素即成为永久性的污染物在土壤中不断累积[3],土壤中重金属的累积,又受到重金属本身的理化性质,土壤质地、粘土、矿物类型、母质、特征、剖面形态结构、有机质含量、土壤阳离子代换量等和输入来源等影响[4-6],所以,土壤中重金属的累积具有空间的变化特征。

本研究以香河县北运河沿岸污灌土壤为研究对象,选取不同深度土壤,研究污灌土壤中 Cu、Pb、Zn、Cd 的变化。

1 材料与方法

1.1 采样方法

选取远离道路,距离北运河100 m的污灌农田现场采样,采样密度和深度的选定是根据地矿部 1990 年《1∶50 万区域环境勘查地球化学研究》成果"进行环境质量评价的土壤采样深度,地表土以 10～40 cm 为宜,采样密度为每 km^2 2 个监测点"。在每个采样点 0～20 cm和 20～40 cm的两个断面分别取样。

1.2 样品前处理

取烘干后的土样2 g,放入100 mL玻璃烧杯中,加少许去离子水湿润,加15 mL王水,于电热板上加热保持微沸,至有机物剧烈反应后,加高氯酸4 mL,继续加热至溶液冒白烟,继续加热,直至土样呈灰白色,小心赶去高氯酸(但要注意不出现棕色烧结干块,若出现此现象,要再加少许王水复原为白色),取下样品,用 1 %硝酸溶解,过滤于25 mL容量瓶中,定容至标线摇匀。同时,做试剂 5 %的空白样、10 %的标样和 10 %的平行样。

2 结果与评价

2.1 土壤重金属随空间变化特征分析

北运河香河段属过境河流,水质分析结果表明,上游入境口重金属含量明显高于出境口重金属含量,本研究分别选取入境口——王家摆,出境口——土门楼两个区域的污灌农田进行采样监测。同时,在调查区域附近,选取母质、土壤类型与调查区域土壤相类似的非污灌区土壤样点——安平作为对照点(采样和

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分析方法同上)。分别测得污灌区和对照点土壤中 Cu、Pb、Zn、Cd 含量值,见表 1。

表 1 污灌区土壤重金属含量 mg/kg

序号	点位	土层深度/cm	Cu		Pb		Zn		Cd	
			范围	均值	范围	均值	范围	均值	范围	均值
1	王家摆	0～20	11.48～19.68	17.59	8.5～19.75	15.15	48.97～76.22	60.23	0.058～0.11	0.0732
2		20～40	9.46～14.25	12.60	9.58～16.75	12.36	40.56～65.63	54.38	0.050～0.095	0.0648
3	土门楼	0～20	13.87～18.45	17.16	6.8～18.32	12.99	45.14～64.38	52.69	0.042～0.099	0.0635
4		20～40	6.72～15.68	12.03	5.82～15.68	9.20	45.14～52.35	48.04	0.038～0.074	0.0522
5	安平	0～20	11.42～17.76	14.76	5.69～17.76	11.66	36.36～54.25	46.38	0.032～0.091	0.052
6		20～40	9.04～13.58	11.21	4.73～15.20	8.21	32.03～46.88	42.54	0.028～0.085	0.048

2.2 数据分析

由土壤中重金属含量变化表分析可知,北运河入境口处的王家摆段面污灌农田 0～20 cm土层 Cu、Pb、Zn、Cd 含量最高,与安平重金属含量比较,重金属元素值差异最大,其中 Zn 含量差异最为明显,王家摆和安平土壤 0～20 cm Zn 含量相差13.85 mg/kg,Cd 含量差异值最小,相差0.0212 mg/kg,Cu、Pb 差异处于两者之间,分别相差2.83 mg/kg,3.49 mg/kg;重金属 Cu、Pb、Zn、Cd 在各点位含量都显示以王家摆含量最高,其次是土门楼,做为参照点,安平重金属含量最低,这一变化说明污水灌溉已经对北运河沿岸土壤已经造成了影响。

数据分析结果表明,王家摆土壤 0～20 cm和20～40 cm土层重金属含量均高于土门楼土壤中相同土层重金属含量,这与北运河水体王家摆断面和土门楼断面重金属污染趋势相同,表明污灌区土壤中重金属累积量和污灌水中重金属含量呈正相关。

由表 1 可见,较深层土壤中重金属含量明显低于表层土中重金属含量,并且,3 个点位深层土壤中重金属含量差异不明显,和其他研究结论相同,说明重金属在土壤中的累积主要集中在表层土。这是因为土壤中的重金属污染物由于无机及有机胶体对阳离子的吸附、代换、络合及生物作用的结果,导致大部分被固定在耕作层中[7]。

3 结论

(1)重金属在土壤中主要累积在表层土,向深层土迁移的速率比较缓慢。

(2)污灌区土壤中重金属含量和污灌时间以及污灌水中重金属含量成正比。

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2006 年度“地球奖”评选活动正式启动

人民网北京 3 月 15 日讯 2006 年度“地球奖”评选日前在北京正式启动。“地球奖”是由中国环境新闻工作者协会于 1997 年设立的,旨在表彰新闻、体育、社会各界及青少年集体在保护环境方面做出的突出贡献。在环境保护领域做出突出贡献的国内宣传教育、科技、企业等从事环保工作和环保活动连续 3 年以上的个人和社会团体,均可申请参加“地球奖”的评选。

Abstract It has been completely discussed the multipurpose use of both ash water and chemical regenerated water coming from a thermoelectric plant. Through optimizing the running way of ash water and chemical regenerated water ,the industrial water supply can be reduced , and no discharge can be realized too. Saving the cost and protecting environment will be achieved at last. After technical innovation ,the water of 684 ,830 m^3 can be saved yearly with a benefit of 890 ,830 yuan per year.

Keywords ash water ,chemical regenerated water ,industrial water supply and technical innovation

Abstract Sequencing biological reactor is adopted to treat high-salinity wastewater of processing marine products. The results show that it is feasible to treat the wastewater in which the proportion of seawater is no more than 50 percent and sequencing biological reactor can resist the high-salinity impact load. When the influent COD_{Cr} = 700～1 000 mg/L ,NH_3-N = 80～120 mg/L and [Cl^-] ≤8 000 mg/L ,the removal rates of both COD_{Cr} and NH_3-N in the effluent are 77.9 %～81.2 % and 69.5 %～76.6 % respectively. With the increasing of [Cl^-] ,the SBR system is affected seriously and treating effect is worsened.

Keywords high-salinity ,wastewater of processing marine products and sequencing biological reactor(SBR)

Abstract A series of experiments was carried out with fluid mechanics experimental methods to study the gas pressure ,the regulation of fluid flow variation ,energy consumption of the ventilator in the vertically circulated wind tunnel. Research on pressure regulation and energy consumption in circulated fluid field systems was carried out. The result of this project may be a good reference for other projects and on the other hand it will probably be beneficial to promoting design quality in ventilating systems.

Keywords circulated fluid ,pressure regulation ,flow control and energy consumption

Abstract SBR design parameters for sewage treatment system are suitable for normal temperature environment(15～30 ℃) ; yet water temperature is in the range of 6～10 ℃ in northern areas in China. Therefore these parameters can not meet the treatment systems in northern areas of China ,and it is difficult for the effluent quality to meet the emission requirements. Hence temperature parameter should be combined with reaction dynamics ,and SBR normal design parameters should be corrected for low temperatures through tests and project examples.

Keywords SBR ,low temperature ,design parameter and correction

Abstract By analyzing soil 's contents of heavy metals ,such as Cu ,Pb ,Zn and Cd in different depths ,the effect of wastewater irrigation on the contents of heavy metals in soil is estimated. The results indicate that the accumulated contents of heavy metals in soil are related directly to the physicochemical properties of soil ,the depth of soil ,the time of wastewater irrigation and the contents of heavy metals in the wastewater.

Keywords wastewater irrigation and heavy metals

Abstract The problem of being unable to put slag blowing systems into operation for a long time in Yangtze Thermal Power Plant is solved through correct lectotype of the blower and its installing reform according to actual conditions. The running data have verified the remarkable effects of the sonic blower on improving boiler efficiency and safety ,which is worth popularized.

Keywords sonic wave ,blower and boiler

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