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Geochemical Characteristics of Heavy Metal Elements and the Detection of the Environment by the Internet of Things in the Horizon of the Internet

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Abstract:This article first introduces the hazards of soil heavy metal pollution, and then takes a research area as the research object to investigate in detail the geochemical characteristics of soil heavy metal elements and their impact on IoT. Classic statistical methods and random forest methods are used to reveal the main controlling factors that affect the content and distribution of soil elements. Refer to relevant standards, evaluate soil quality from the two aspects of soil environmental quality and nutrient abundance, and use SPSS software to analyze and establish a model of the relationship between rice and soil heavy metals. The main research results have increased by 12.7%.

Keywords: Geochemical Characteristics, Heavy Metal Elements, Detection of the Environment, Internet of Things

1. INTRODUCTION

Land is an important natural resource element for the development of human society. With the rapid development of my country's society and economy, issues such as land quality, soil pollution and the safety of agricultural products caused by it have attracted more and more attention. This thesis is based on the "1: 50,000 Land Quality Geochemical Survey of Jiangshan and Other Places in Quzhou City, Zhejiang Province" project, which belongs to the second-level project of the Ministry of Finance "The Geochemical Survey and Application Demonstration of Land Quality of Basic Farmland in the Lower Reaches of the Pearl River and Zhejiang Province" (subject to in the "Land Geochemical Survey Project"), the beginning and ending years are from 2016 to 2018. The main task of the project is to conduct a 1:50,000 land quality geochemical survey in the cultivated land concentration area of Jiangshan City to find out the soil environmental quality, nutrient abundance and deficiency, evaluate the comprehensive soil quality level, and combine irrigation water, atmospheric dry and wet precipitation, and crops. Survey results data, classify the geochemical grade of land quality. Use the land quality geochemical survey data of Fenglin-Xiakou area of Jiangshan City obtained by this project to carry out related research of this paper. Collect basic data such as topography and geomorphology, geological background, soil types, land use status and plot distribution (secondary land adjustment data), crop types and planting conditions, and major pollution sources in the survey area, and combine actual data obtained from field reconnaissance and surveys. Comprehensive analysis, based on the principles of relative uniformity within the evaluation unit and obvious differences between different units, scientifically and rationally divide the geochemical evaluation unit of land quality [1-7].

1: 50,000 sampling points for the geochemical survey of land quality are arranged in order to arrange sampling points on the distribution map of the evaluation unit to carry out scientific research. Taking farmland soil in the plough layer as the main survey object, taking into account the indicator of farmland ecological environment quality—crops, and carrying out systematic sampling and analysis. Through the soil geochemical measurement of the cultivated layer, the local soil element geochemical distribution characteristics are ascertained, the soil environmental quality, nutrient abundance, and ecological health quality are evaluated, and on this basis, the soil geochemical quality is comprehensively evaluated. Evaluate the edible safety of agricultural products based on crop sampling and analysis data and refer to relevant standards. Comprehensive evaluation is carried out on the basis of single-element evaluation of soil and crops. Heavy metals are potentially harmful pollutants in the soil environment. Soil heavy metal pollution refers to the phenomenon that heavy metals are introduced into the soil due to various human activities, which causes the heavy metal content in the soil to be significantly higher than the original content of the soil, and further causes ecological deterioration. In environmental pollution research, it mainly refers to heavy metal elements with significant biological toxicity such as As, Pb, Cd, Cr, and Hg. These elements are not needed during the growth and development of plants, but plants can absorb these elements through the soil, and then eat them. These plants cause harm to the human body [8-16].

Heavy metal pollution has the following four characteristics: Universality: With the continuous development of modern industrial production, heavy metal pollution threatens almost every country. In the 1950s, the "bone pain" in the Toyama River Basin in Japan was caused by excessive Cd in brown rice due to Cd pollution. In 1997, two agricultural areas in Montana, USA were also contaminated by Cd, which made the local wheat inedible. The suburbs and irrigation areas of many cities in my country have been polluted by heavy metals to varying degrees, such as the Zhangshi irrigation area in Shenyang. In the distribution of elements in nature, the concentration of heavy metals is natural concentration, and the content is low, which will not cause any impact on people's lives. In recent years, there have been more and more mining, smelting, processing and commercial activities of heavy metal elements. Many heavy metals such as mercury and lead have entered the atmosphere, water, and soil, and people's living environment has been seriously affected. Heavy metals generally exist in various chemical states or chemical forms [17-24].

2. THE PROPOSED METHODOLOGY

2.1 The Geochemical Characteristics of Heavy Metal Elements

In order to fully understand the content and changes of the elements in the soil, the control factors, etc., two comprehensive geochemical profiles were measured, which run through all the geological units and soil units in the whole area. The samples collected include surface soil samples, deep soil samples and rocks. The sampling interval is 50-100m. The soil vertical profile sampling points are arranged according to different soil parent materials and different alluvial-proluvial areas. The slope profile is selected in the middle of the slope, and the Pingba section is selected in areas far away from villages, roads and areas with obvious human pollution. The vertical profile depth is 2 About meters, the slope is subject to the bedrock seen, and the Pingba area is subject to the groundwater surface. For sections with significant soil stratification, samples are collected from the humus layer, leaching layer, sedimentary layer, parent material layer and parent rock, and for the sections with insignificant stratification, one sample/20～10cm equal spacing is sampled, and the base is exposed. Collect rock samples at the rocky place.

Collect near-surface dust (dust and floating dust) from 1 to 2 meters above the ground. The sampling method is to use brushes to collect dust from residents' wooden doors and windows or public facilities, and try to avoid pollution sources (such as industrial pollution, civil coal, etc.) The road is not less than 150 meters), the same number points and one point (2～3) are used for sampling. The samples collected at each point are packed in small polyethylene ziplock bags, and each sample is affixed with a sample. After labeling, put it into a medium-sized polyethylene ziplock bag. After the sample is dried, weigh the same amount according to the smallest sample amount among the 5 points to form a sample, and weigh about 20 grams after being sieved with 200 mesh. The soil sample analysis is undertaken by the Chengdu Mineral Resources Supervision and Testing Center of the Ministry of Land and Resources. The testing center establishes a supporting program for multi-element determination with XRF and ICP-MS as the main body.

2.2 The Iot Detection of Heavy Metal Elements

Data analysis and mapping: Descriptive statistics of survey data using classical statistical methods, including the average, median, maximum, minimum, standard deviation, coefficient of variation, etc. of each element, to master the geochemical background of soil elements; Use Mapgis, Core DRAM and other software to draw geochemical maps, find out the regional distribution of elements, analyze the influencing factors; apply random forest method to reveal the main control factors that affect the content and distribution of soil elements; according to the soil environmental quality standard (GB15618-1995), Evaluation of soil environmental quality; evaluation of soil nutrient abundance according to land quality geochemical evaluation norms (DZ/T0295-2016); evaluation of soil nutrient abundance according to national food safety standards (GB 2762-2017) for heavy metals in rice crops Exceeding standards are evaluated; SPSS software is used to analyze and establish the relationship model between rice and soil heavy metal elements.

The number of published articles can indicate the degree of concern for a certain subject area, and the number of continuous publications year by year can reflect the change in the degree of concern for that subject area. Figure 1 shows the trend of educational big data literature over the years included in the WOS core database.

2.3 The Harm of Heavy Metals in Soil and Its Prevention

Automobile exhaust is considered to be one of the important sources of Pb pollution. With the development of the automobile industry and the use of leaded gasoline, urban air was polluted by lead and then spread to the suburbs, where it settled on the soil on the arable land in the suburbs, polluting vegetables and other crops. According to statistics, if you add 1 to 3 grams of ethyl lead per kilogram of gasoline, the lead in automobile exhaust can reach 20 to 50 micrograms/liter. Motor vehicle exhaust emissions are not only the main pollution source of the urban atmosphere, but also significantly cause roads. Heavy metal pollution on both sides, automobile gasoline, engine tires, lubricating oil and metal-plated parts can burn or wear and release heavy metals such as Pb, Cd, Cu, and Zn. Pb exists in the air in the form of aerosols and compounds of different sizes, and enters the soil through plant adsorption or precipitation. Gu Wenxing's survey results show that the lead content of the soil has a negative correlation with the distance of the road, and the correlation coefficient is -0.9952. The research results of Zheng Lu et al. showed that the lead content of vegetable garden soil and vegetables in Hefei is positively correlated with vehicle flow, and negatively correlated with highway distance.

The discharge of industrial "three wastes" is the main source of soil pollution. Reasonable layout of industry, adjustment of industrial structure, optimization of resource allocation, and minimization of pollutant discharge. Controlling the discharge of pollutants from the source is the key to solving heavy metal pollution.

3. CONCLUSION

To sum up, this article selects the study area to conduct a detailed study on the geochemical characteristics of soil heavy metal elements and the impact assessment on the ecological environment. The soil heavy metal elements in this area are all low and below the light pollution level. Pay attention to the protection of soil quality and safety, and prevent problems before they occur. The random forest method was used to analyze and analyze the causes of soil elements, and it was found that the results of the Internet of Things test were the most important geological conditions affecting the content of soil heavy metals. The cause of soil was the main influencing factor of Cd, Hg, and Pb. The element content has little effect.

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