RESEARCH ON THE MIGRATION SIMULATION OF HEAVY METAL Cr, Pb and Zn IN SOIL OF MINING AREA

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Introduction

The exploitation and utilization of mineral resources has changed the material cycle and energy flow in the ecosystem of mining area, caused serious ecological pollution and environmental damage (Liu, 2006; Liu, 2009). Among them, the heavy metal pollution in mining area is one of the most serious problems (Bian, 2001; Shen et al., 2013; Ministry of Environmental Protection, 2013). Soil heavy metal pollution is concealed, long-term and irreversible (Shi et al., 2010), and it is difficult to be decomposed by microorganisms (Wang et al., 2006). Therefore, heavy metals are easy to accumulate in the soil environment, which results in the soil structure damaged and the soil quality declined. In addition, the heavy metals in soil environment can pollute agricultural products and threat human health indirectly through the contact, food chain and other means (Yang et al., 2006; Li et al., 2006; Zhang et al., 1996; Wang et al., 2005). Thus, more and more attention has been paid to the heavy metal pollution and the safety of the growing crops in mining area, and the researches on the heavy metals' migration and distribution in soil and crops have become a hot spot of the domestic and foreign scholars (Dong et al., 2011; Querol et al., 2011; Clark et al., 2001; Maas et al., 2010; Imperato et al., 2003; Peter et al., 2010).

The paper designed and implemented the migration simulation experiment of the heavy metals Cr (heavy pollution), Pb (moderate pollution), Zn (mild pollution) in soil-wheat system in the field of natural condition. Based on the detection of heavy metals' content in soil and wheat by using system sampling and laboratory traditional chemical methods, the migration and distribution characteristics of heavy metals in soil and wheat were analyzed, and the migration model of heavy metals in soil-wheat system was established to explore the migration law of heavy metals in soil-wheat system. The preliminary analysis results show that (1) the contents of heavy metal Cr, Pb and Zn in adding experimental sites are slightly higher than the control site, which explains that the three kinds heavy metals in the soil-wheat system have migration phenomenon, but the migration degrees are small; (2) compared with Cr and Zn, the migration of Pb in soil-wheat system is obvious. The research can provide data and theoretical basis for promoting the improvement of soil environmental quality and food safety regulation in mining area.

Methods

(1) Experimental process

The experiment was divided into four groups, the first group was the control group, and the second to fourth group were the experimental group. The specific steps of experiment contain site selection and sample layout, organic glass column buried and heavy metal added, wheat planting in the control site and organic glass columns.

(2) Sample collection, preparation and detection

The wheat samples and the corresponding surface soil samples from the control site and the organic glass column were collected. The soil samples were dried, grinded, cooked and constant volume to make as the soil sample liquid; the wheat samples were dried, shelled, crushed, cooked and constant volume to make as the wheat sample liquid. The contents of heavy metals Cr, Pb and Zn in soil samples and wheat samples were detected by Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

Results

According to analyzing the content of heavy metals in soil samples and wheat samples from the field experimental sites, the results show that, in the low limit value of the heavy metal adding experiment, the contents of heavy metal Cr, Pb and Zn in adding experimental sites are slightly higher than the control site, which explains that the three kinds heavy metals in the soil-wheat system have migration phenomenon, but the migration degrees are small; compared with Cr and Zn, the migration of Pb in soil-wheat system is obvious.

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