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不同添加剂对铅冶炼污染土壤中铅、镉稳定效果的研究

Immobilization of Pb and Cd in a lead smelting polluted soil with different amendments

关键词: [铅冶炼](#) [污染](#) [土壤](#) [稳定](#) [盐酸](#)

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摘要: 为了研究铅冶炼形成的重金属复合污染石灰性土壤中重金属的稳定方法,在污染土壤(Pb、Cd含量分别为2337和21.4 mg·kg⁻¹)中分别加入磷酸二氢钾、磷酸二氢钙、石灰、盐酸、磷酸,通过盆栽试验探讨了不同添加剂对土壤重金属有效性和黑麦草(*Lolium perenne* L. cv. Rainbow)性状的影响.结果表明,加入石灰显著降低了土壤中DTPA-Cd含量,但对DTPA-Pb含量无显著影响;加入盐酸显著增加了土壤DTPA-Cd含量,对DTPA-Pb含量无明显影响.磷酸二氢钾、磷酸二氢钾与盐酸配合、磷酸二氢钙和磷酸均显著降低了土壤DTPA-Pb(降低幅度为39.5%~47.8%)和DTPA-Cd含量(降低幅度为10.5%~19.4%)($p < 0.05$).且磷酸二氢钾和盐酸配合处理与单独加入磷酸二氢钾处理相比,土壤DTPA-Pb含量下降了12.6%($p < 0.05$).磷酸二氢钾和盐酸配合处理土壤的Olsen-P含量和pH均显著低于单独加入磷酸二氢钾处理.加入石灰和盐酸处理的植物产量显著低于除对照外的其它处理,其余处理地上部产量比对照增加了100%~140%.加入盐酸显著增加了植物地上部镉含量,各处理均显著降低了植物地上部铅含量($p < 0.05$).

Abstract: To assess the effect of different additives on the immobilization of Pb and Cd in polluted soils, a lead smelting polluted calcareous soil, containing enhanced Pb (2337 mg·kg⁻¹) and Cd (21.4 mg·kg⁻¹), was treated by additions of potassium dihydrogen phosphate (PDP), calcium dihydrogen phosphate (CDP), lime, hydrochloric acid and phosphoric acid, respectively. The treated soils were then tested in pot experiment of ryegrass (*Lolium perenne* L. cv. Rainbow) and the effects were evaluated by analyzing the availability of Pb, Cd and P in the soils and the properties of ryegrass after harvest. The results were summarized as following. Addition of lime decreased the DTPA-Cd content while did not affect the DTPA-Pb content significantly ($p > 0.05$). Hydrochloric acid addition increased DTPA-Cd content ($p < 0.05$) while did not affect the content of DTPA-Pb. Compared with the control, addition of PDP, PDP combined with hydrochloric acid, CDP and phosphoric acid decreased the contents of both DTPA-Pb (39.5%~47.8%) and DTPA-Cd (10.5%~19.4%) significantly ($p < 0.05$). Moreover, compared with PDP, addition of PDP combined with hydrochloric acid decreased the DTPA-Pb content by 12.6% ($p < 0.05$), and the pH and Olsen-P content were lower when PDP was combined with hydrochloric acid. Plant yields with lime and hydrochloric acid treatments were only slightly higher than that of the control, while the yields of other treatments were 100% to 140% higher than that of the control. Treatment with hydrochloric acid improved the shoot Cd content significantly, and all the treatments decreased the shoot Pb contents significantly ($p < 0.05$).

Key words: [lead smelting](#) [pollution](#) [soil](#) [immobilization](#) [hydrochloric acid](#)

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