研究论文

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化学融雪剂**NaCl**和**KCOOH**对城市街道绿化土壤中重金属**Pb**和**Cu**迁移行为的影响

Effects of deicing chemicals sodium chloride and potassium formate on metal mobilization in urban roadside soils

关键词：化学融雪剂 NaCl KCOOH 城市街道绿化土壤 重金属

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作 者 单位

张 营 1. 辽宁大学环境学院, 沈阳 110036;2. 湖南农业大学资源环境学院, 长沙 410128

李法云 1. 辽宁大学环境学院, 沈阳 110036;2. 湖南农业大学资源环境学院, 长沙 410128

范志平 辽宁石油化工大学生态环境研究院, 抚顺 113001

程志辉 1. 辽宁大学环境学院, 沈阳 110036;2. 湖南农业大学资源环境学院, 长沙 410128

李 霞 辽宁大学环境学院, 沈阳 110036

摘要：长期大量使用传统氯盐型融雪剂(NaCl)导致的城市环境问题引起了广泛重视,探究甲酸钾(KCOOH)等有机替代型融雪剂的环境效应十分必要.本研究采用土柱淋溶方法探讨0.01 mol · L^{-1}、0.05 mol · L^{-1}和0.1 mol · L^{-1}不同浓度NaCl和KCOOH处理对沈阳市街道绿化土壤重金属Pb、Cu迁移行为的影响.结果表明NaCl和KCOOH处理浓度的增加显著提高土壤中Pb和Cu 的释放量,且同浓度NaCl和KCOOH处理土壤对Cu的释放量均高于对Pb的释放量.两种处理下土壤对Pb、Cu释放量与土壤可溶性有机质含量显著相关表明胶体运移是重金属Pb、Cu迁移的主要方式.KCOOH对土壤胶体扩散的作用较NaCl更小,以及 KCOOH处理下土壤氧化还原电位降低pH升高是KCOOH对土壤Pb和Cu释放量低于NaCl的主要原因.因此,与传统无机型融雪剂NaCl相比,有机型融雪剂KCOOH可一定程度降低城市街道绿化土壤中Pb、Cu的淋溶释放.

Abstract：Widespread use of traditional deicing chemicals such as sodium chloride (NaCl) resulted in serious urban environmental problems. Alternative organic deicing chemicals, i.e., potassium formate (KCOOH) and their environmental impacts are urgently needed especially for the vulnerable sites. Column leaching experiment was conducted to study the potential effects of 0.01 mol · L^{-1}, 0.05 mol · L^{-1} and 0.1 mol · L^{-1} NaCl and KCOOH on the mobility of soil lead (Pb) and copper (Cu) in urban greenbelt of Shenyang city, Northeast China. The results showed that a clearly extensive mobilization of Pb and Cu was occurred with the increase of both NaCl and KCOOH concentrations. The total amount of Cu leached from the column was higher than Pb under the same concentration of deicing chemical. The high Pb and Cu concentration coincided with peaks of organic matter concentration; this implied that colloid-assisted transportation was the main pathway. Compared with NaCl, KCOOH had lower abilities on metal and organic matter mobilization. The increase of soil pH and decrease of soil redox were another two reasons of soil Pb and Cu retention. This indicated that KCOOH is favorable on reducing Pb and Cu mobility in soils, and can be a good alternative for NaCl.

Key words：deicing chemicals NaCl KCOOH urban greenbelt soils heavy metal

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