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Accumulation of Cd, Co, Cr, Cu, Mn, Ni, Pb and Zn in urban soil and their mobility characteristics

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Abstract. Eight trace metals, Cd, Co, Cr, Cu, Mn, Ni, Pb and Zn, were measured in the urban soil of Guwahati City, Assam, India from 31 sites representing five different types of land use, residential, commercial, industrial, public utilities, and roadside. Cd and Co occurred in very low concentrations (Cd << Co) in all types of land use without any significant variation from one type of land use to another. Ni concentrations were more than those of Co, and the concentrations depended on land use pattern. Average Cr and Cu concentrations were ≥ 100 mg/kg, but Cr had a significantly higher presence in industrial land use. Pb concentrations showed similar trends. The two metals, Mn and Zn, were present in much larger amounts compared to the others with values ≥ 300 mg/kg. Industrial and roadside soil contained much more Mn while commercial soil was enriched with Zn. Toxicity Characteristic Leaching Procedure (TCLP) was used for elucidating the mobility characteristics of the eight heavy metals. Mn suffered the highest leaching from commercial land (9.9 mg/kg on average) and also from other types of land. Co, Cu and Pb showed higher leachability from commercial soils but the leached concentrations were less than those of Mn. The two metals, Zn and Ni, were leached from residential land in considerable amounts. The TCLP showed Mn to be the most leachable metal and Cr the least.

Keywords: heavy metal accumulation; TCLP; leaching; urban soil; Cd; Co; Cr; Cu; Mn; Ni; Pb; Zn

1. Introduction

Soils of urban areas are often degraded in quality compared to agricultural or natural soils. Intense human activities associated with construction, transport, import of materials, etc., disturb the heterogeneity of urban and suburban soils, sometimes producing young soils with unpredictable layering (Tiller 1992, Linde *et al*. 2001). The urban soil is the receptor of significant quantities of pollutants accumulating from traffic and industry related emissions and deposition, and dumping of wastes. These modify soil properties and increase pollutant contents, especially of the potentially toxic trace elements (Bullock and Gregory 1991, Adriano 2001, Moller *et al*. 2005, Ruiz-Cortés *et al*. 2005, Lu *et al*. 2007). Urbanization has altered the physical, chemical and biological properties of soils (Thornton 1991) throughout the world, the degree of such modification being dependent on the relative level of human disturbance.

Hu *et al*. (2013) analyzed 227 surface soil samples from Guangdong Province, China for As,

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