

IE-2 Characteristics of Chlorine and Metal(loid)s in Residue and Soil from an Open Dumping and Burning Site of Municipal Solid Waste in Kabwe, Zambia

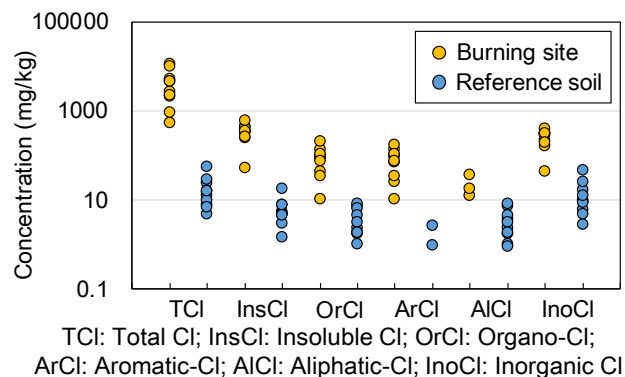
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INTRODUCTION

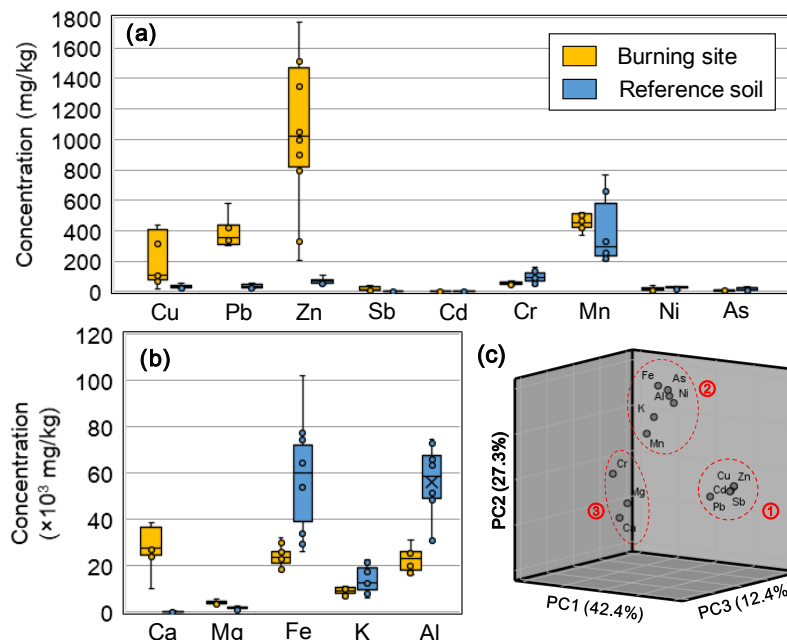
Burning municipal solid waste (MSW) at the local dump is still a common practice somewhere. Chlorine and metal(loid)s (e.g., Cu, Pb, Zn, As, Cd, Sb, etc.) are often contained in MSW. Open burning of MSW leads to not only release of these elements to local environment but also formation and emission of toxic chlorinated aromatics (PCDD/F, PCB, CBz, Cl-PAH, etc.)¹.

In this study, residue samples from a MSW open dumping and burning site in Zambia as well as the surface soil in nearby area were collected and characterized, aiming at investigating the influence on (a) distribution of chlorine (content and speciation) and (b) contamination of metals and metalloids to the local environment.



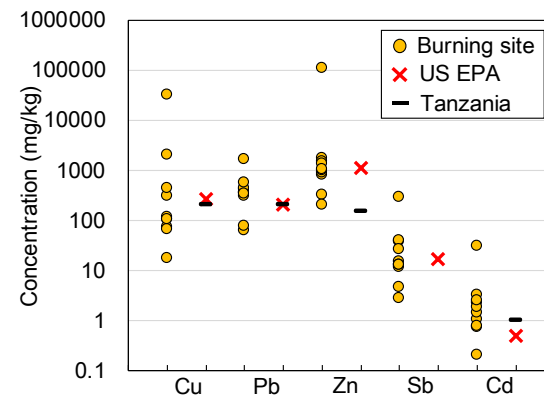
CONCLUSIONS

Open dumping and burning of MSW caused contamination of chlorine and specific heavy metals to the local soil. Besides the already identified toxic chlorinated aromatics (PCDD/Fs, PCBs, etc.), open burning of MSW also caused emission of large amounts of unidentified Aromatic-Cl. Among the 14 tested metal(loid)s, heavy metals such as Cu, Pb, Zn, Sb and Cd were significantly higher in residue samples than in the control soil.



MATERIALS AND METHODS

Ten soil/ash mixture samples at the surface layer along the dumping and burning district were collected, as well as ten surface soil samples from a nearby un-dumped area. The Cl concentration in original samples and samples washed with aqueous solution was measured by combustion ion chromatography (CIC). Cl speciation was determined by Cl K-edge X-ray absorption near edge structure (XANES). Concentrations of 14 metal(loid)s were detected by inductively coupled plasma mass spectrometry (ICP-MS) and atomic emission spectroscopy (ICP-AES).



FURTHER DISCUSSION

Aromatic-Cl in residue samples are much higher than identified chlorinated aromatic compounds typically found in soil/ash from open dumping and burning sites (PCBs: 0.0065-0.11, PCDD/Fs: 0.0038-0.021, dl-PCBs: 0.00091-0.0016 mg/kg)². Most of the Aromatic-Cl (>99%) produced by open burning of MSW remains unidentified.

Except for Cr, Mn, Ni and K, statistical differences existed in the other 10 metal(loid)s ($p < 0.05$) among different types of samples. Pb, Zn and Cd in most of the residue samples exceeded the regulatory limits in standards of heavy metals in agricultural soil of US EPA and/or Tanzania.

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