Bioavailability of metals in a creek environment in Mumbai, India

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A sediment core collected from Thane creek (north-east of Mumbai) in India was studied, with an aim to assess the degree of sediment contamination and bioavailability of metals. The concentration and chemical distribution of elements (Al, Fe, Cu, Cr, Mn, Co, Pb, Ni, Zn) along with speciation of selected metals was determined to know the extent to which selected elements were bioavailable and also to differentiate the anthropogenic metals from those of natural origin.

Geoaccumulation index computed for the studied elements, show Cu, Pb and Cr are moderately polluted. In accordance with these results, sequential extraction was carried out, to identify if Pb, Cr and Cu in the different sediment phases are bioavailable. From the results, for Cu, the order of percentage contribution is Residual (F5) >Fe-Mn oxides (F3)>organic/sulphide (F4)>carbonates (F2) >Exchangeable (F1), for Cr it is F5>F4>F3>F2>F1 which clearly indicates that, these metals are primarily immobile and have or bear the least bioavailability. For Pb it appears to be F5>F3>F4>F1>F2. Metals, especially of anthropogenic input, are expected to associate with the first four fractions and metals found in the residual fraction are considered to be of natural occurrence derived from the parent rock. For Pb, the percentage of the first two fractions (F1 & F2) are high when compared to first two fractions of Cu and Cr. F1 and F2 are very important from an ecotoxicological point of view because these are the fractions that are readily bioavailable to organisms that ingest sediments and hence can pose a health threat to the aquatic environment.

Use of CO_2/H_2O IRGA-based evolved gas analysis during thermal analysis of soil organic matter

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Despite the increasing use of thermal analysis to characterize soil organic matter (SOM) in recent years, the exothermic region that represents the temperature range in which SOM is oxidized has not yet been equivocally defined.

In this study, surface soils from 28 sites across North America, ranging from Alaska to Puerto Rico, were analyzed in an oxidizing atmosphere (synthetic air, 30 mL min^{-1}) with a simultaneous thermal analyzer (thermogravimetry and scanning differential calorimetry) coupled to an infrared gas analyzer (IRGA) to measure CO_2 and H_2O gases evolved from thermal reactions.

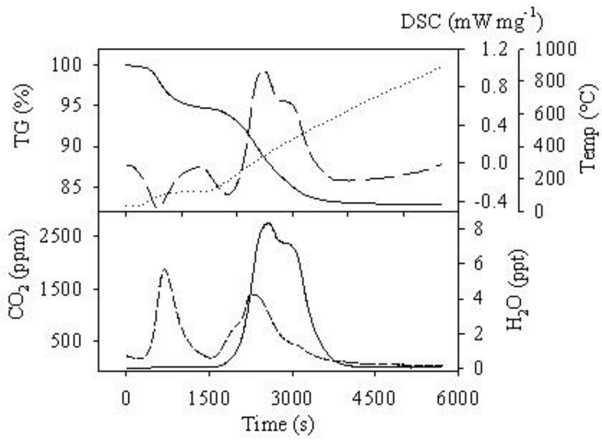

Figure 1: a) DSC (mW mg^{-1}), TG (%) and temperature (°C) of thermal analysis of a bulk soil sample, and **b)** evolved CO_2 (ppm) and H_2O (ppt) measured by IRGA.

Evolved CO_2 gas analysis suggests the onset temperature of the exothermic region was 256 ± 18 °C, though CO_2 evolution typically began near 125 °C. The endset temperature was typically 537 ± 36 °C, but varied widely due to the presence of pyrogenic C or carbonates. Defining the exothermic region is essential to characterizing SOM using thermal analysis.