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Lead Removal from Industrial Waters by Water Hyacinth

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Abstract.

This is a preliminary study intended to develop a method for treating industrial waters that are contaminated with lead. Lead uptake caused by hydroponics feeding into water hyacinth (Eichhornia crassipes) was monitored by atomic absorption spectroscopy AAS. Uptake, excretion and oscillation processes were observed.

At lower concentrations of 0.001 M, high lead accumulation was observed in the roots and leaves. At higher concentrations of 0.01 M, the lead from roots and leaves drained into the petiole.

***Keywords**: lead, industrial wastewater, hydroponics feeding, water hyacinth, Eichhornia crassipes, atomic absorption spectroscopy AAS*

Introduction

Lead occurs naturally in the earth's crust, in ores such as galena, lead (II) sulfide and PbS. However, human activity has resulted in atmospheric lead, mainly as $PbSO_4$ and $PbCO_3$. Lead is generally resistant to corrosion, but will dissolve in low pH, acid water. Beside such weak solutions, a significant fraction may be present in an undissolved form, colloidal particles, or larger particles of lead (II) carbonate, lead (II) oxide, and lead (II) hydroxide. Lead may be leached out, or washed out in suspension from pipes or from soil after heavy rains or flooding especially in acid conditions. Hence, lead contaminated waters may be found near foundries producing metal alloys containing lead, such as brass and bronze; and also near petroleum refineries, where leaded gasoline is produced. Tetraethyl lead (TEL), an organic alkyl compound, is used to increase the gasoline grade, measured in "Octane Number" and thus prevents 'knocking' in petrol engines.

Environmental pathways for lead transportation may be via air, water and soil (**Beverland and Agius** 2002). The atmosphere path includes lead particles emitted from vehicles as halides (e.g. PbBrCl, PbBrCl. NH_4Cl), and lead particles emitted from mines and smelters primarily in the form of $PbSO_4$, $PbO.PbSO_4$, and PbS. In the atmosphere, lead exists primarily in the form of $PbSO_4$ and $PbCO_3$.

The water path includes significant fraction in the form of colloidal or larger undissolved particles of lead (II) carbonate, lead (II) oxide and lead (II) hydroxide, resulting from lead's tendency to form compounds of low solubility, with the major anions found in natural water. The ratio of lead in suspended solids to lead in dissolved form has been found to vary from 4:1 in rural streams, to 27:1 in urban streams.

The soil pathway includes paint, dry and wet deposition of atmospheric lead; industrial contamination (sparingly soluble solid phases with long residence times) and relatively stable chelates (organo-metal complexes) with the organic matter in soil. Evidence of rapid conversion to lead (II) sulfate at the soil surface exists.

In soils with a pH greater or equal to 5, and with at least 5% organic matter, atmospheric lead is retained in the upper 2-5 cm of undisturbed soil. Mobilization as soil particles in run off feeding surface waters during heavy rains, and mobilization from soil

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