

LEAD AND ZINC CONTAMINATION OF ROADSIDE SOIL AND VEGETATION IN HALIFAX, NOVA SCOTIA

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Lead and Zinc concentrations were measured in roadside soils and vegetation (*Poa pratensis*) in the city of Halifax, Nova Scotia, and are related to: i) traffic density—soils and vegetation had higher concentrations near high volume roads than near low volume roads; ii) distance from the roadedge—concentrations decreased exponentially with increasing distance; and iii) soil depth—concentrations decreased with increasing depth.

Des mesures de la concentration en plomb et en zinc ont été effectuées sur les sols et la végétation (*Poa pratensis*) de la bordure des routes de la ville d'Halifax, Nouvelle-Ecosse. Ces concentrations sont reliées à: i) la densité de la circulation—les sols et la végétation situés près des routes à grande circulation avaient des concentrations plus élevées que celles des sols et de la végétation situés aux abords des routes à faible circulation; ii) la distance de la marge de la route—les concentrations décroissent, d'une façon exponentielle, avec une augmentation de la distance; iii) la profondeur du sol—les concentrations décroissent avec une augmentation de la profondeur.

Introduction

In 1923, lead was first introduced as a gasoline additive in the form of tetraethyl lead (TEL: $\text{Pb}(\text{C}_2\text{H}_5)_4$). TEL concentrates combustion processes in gasoline engines, allowing an increase in the compression ratio without the risk of knocking. The use of TEL creates a higher octane rating in gasoline and, hence, improved fuel economy (Phillips 1973). During the post-World War II period, leaded gasoline was introduced into most developed countries (Hutchinson 1973a). The use of leaded gasoline in the transportation sector, especially in automobiles, produces an increase in atmospheric lead concentrations to the extent that automobile lead emissions in the United States during 1974 were the major source of lead (60%) to the atmosphere (Nriagu 1978). The 1970 estimated world use of tetraethyl lead was 3.2×10^5 tonnes (Stubbs 1973). Alkyl leads are extremely toxic, volatile, and unstable, and they are human health hazards at their sites of production (Barry 1978). However, the lead emitted from automobiles and to a lesser extent planes, trains, etc., is in the form of lead halides (Anonymous 1973a). These are wind-dispersed in the environment according to particle size, and they amounted to 267×10^3 tonnes lead/yr globally during 1974-75 (Nriagu 1978). Total emissions of lead to the atmosphere in Canada were 21,400 tonnes in 1970, of which 66% originated from automobile exhaust (Anonymous 1973c).

Zinc compounds such as zinc oxide, and zinc dimethyl or diethyl carbamate are used in the vulcanization of rubber. As a consequence, zinc is emitted by the erosion of automobile tires. It was estimated that during 1972, 800 tonnes of zinc were released into the Canadian environment from tire erosion (Anonymous 1973b). Zinc is also found in lubricating oils as an additive, for example as zinc dithiophosphate (Lagerwerff and Specht 1970).

Since the early 1960's there have been numerous reports concerned with metal contamination, especially lead and zinc, of air, biota, and soils near roadways (Cannon and Bowles 1962; Warren et al. 1966; Lagerwerff and Specht 1970;