Glass ceramics and mineral materials for the immobilization of lead and cadmium from Municipal Solid Waste Incinerator ashes

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Waste management is one of the major global issues. Incineration is an efficient treatment since it offers both a reduction of mass and volume and a possibility of energy recovery. One of the problems of incineration is the production of bottom and fly ashes which are considered as hazardous waste with obligation of final disposal into a specific landfill.

The objective of the present study is to investigate glass ceramics and sintered ceramics as new mineral materials for a sustainable immobilization and possible recycling of these incineration wastes. Toxic elements can be incorporated into embedded crystals in a glass matrix which has a function of the second barrier, or in highly resistant crystalline structure. Based upon cations size considerations, this study is focused on Ca-rich or Ba-bearing minerals as possible hosts of lead and cadmium.

Promising results have been obtained for $CaMgSi_2O_6$ diopside-bearing glass ceramics and sintered $Ba_{1.5}Mg_{1.5}Ti_{6.5}0_{16}$ hollandite, both in terms of toxic elements incorporation and of chemical and mechanical resistance.

Stable isotope composition of anthropogenic thallium deposition

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Thallium compounds are volatile at high temperature and not efficiently retained by emission control facilities of combustion sources. This study represents the first use of stable isotope ratios to apportion near-source Tl deposition to the emitter. In 1979, dust containing Tl was emitted by a cement plant near Lengerich, NW Germany. The emission event was caused by a ferric oxide additive to the powdered lime (used for the production of special cements), which contained a Tl-bearing residue of pyrite roasting. Following the emission event, sheep died and rabbits and horses were reported to loose fur and hair in the vicinity of the cement plant [1]. The cement plant owners denied responsibility for the bulk of the emissions. We determined the Tl isotope compositions ($\varepsilon^{205}Tl$) of the cement dust (open symbol) and soil cores down to 100 cm depth (black symbols), and the data are in accord with a two-source mixing line (Fig. 1). Our novel isotope analysis ultimately helped the plaintiffs to settle the case by showing the causation of the pollution event, even though the emissions happened more than 30 years ago.

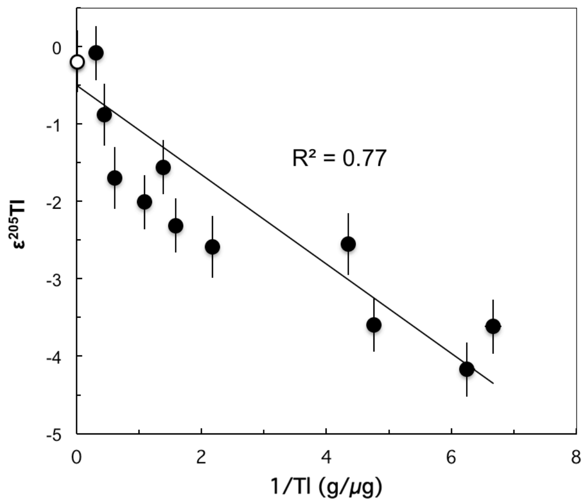

Figure 1: Tl stable isotope data vs. inverse Tl concentrations for soil samples of increasing depth from left to right.

[1] Schoer (1984) In: Hutzinger (ed.), Handbook of Environmental Chemistry, Vol. **3c**. Springer, New York, 143–214.

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