Geophysical Research Abstracts
Vol. 13, EGU2011-1429, 2011
EGU General Assembly 2011

Characterization and identification of slags and ashes as critical components in urban soils.

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The solid coproducts generated during steel or iron manufacturing are in form of slags and ashes with the world wide annual production for both materials reaches almost 50 million tons. In the past, these materials were uncontrolled deposed in the environment, while today they are used for road construction, in ballast for railway tracks, as fertilizers or soil conditioners. Especially waste combustion ashes as well as steel slags bear environmental risks, since they may contain elevated heavy metal contaminants. However, the different slag and ash types are not easily identified in the field since their composition and structural properties are often very similar.

Thus, we developed FTIR-based methods to identify different slags and ashes. Spectra of 50 different slags and ashes were measured in the mid-infrared region, which were further used to develop statistical classification methods to separate spectral data of different slags and ashes types from each other.

Principal component analysis (PCA) models for each material class were developed and further used for soft independent modelling of class analogy (SIMCA) which is known as a supervised pattern recognition method. Additionally, we developed a support vector maschine (SVM) model which is a pattern recognition method based on statistical learning. Results of both methods are discussed and the robustness of both methods compared. As result we provide with FT-IR spectroscopy a useful time- and cost-efficient method for processing and identifying large numbers of unknown manufacturing borne samples. In a further step, models will be developed to identify slags and ashes when mixed in urban soil samples as a useful tool for environmental risk assessment.