

Characterization of Dioxins in Sewage Sludge

*Ming Zhang¹, Miho Yoshikawa¹, Junko Hara¹, Hajime Sugita¹, Yoshishige Kawabe¹

1. Institute for Geo-Resources and Environment, Geological Survey of Japan, AIST

Dioxins are a group of chemically-related compounds that are highly toxic. They are mainly byproducts of industrial practices and can be produced through a variety of incineration processes such as improper municipal waste incineration and burning of trash. Although technologies are available that allow for controlled waste incineration with low dioxin emissions in recent years, environmental contamination by dioxins remains one of big issues today because they are chemically stable and resistant to degradation in the natural environment. Dioxins are found throughout the world in the environment and they accumulate in the food chain, mainly in the fatty tissue of animals, and may result in high concentrations in sewage sludge.

Characterization of dioxins in sewage sludge is not easy because they have a variety of congeners and have strong adsorption to organic matters. Referring to CEN/TS 16190: 2011, and using the sample provided by Federal Institute for Materials Research and Testing, BAM, this study examined the analytical accuracy of dioxins in sewage sludge by using gas chromatography with high resolution mass selective detection (HR GC-MS). In addition, a comparison between the results obtained by using different columns, specifically, BPX-DXN(SGE) and RH-12ms (Inventx) was made to investigate potential effects from the column being used.

The results demonstrated that both BPX-DXN(SGE) and RH-12ms (Inventx) can be used to analyze dioxins with an acceptable accuracy, i.e., the effects of column are negligible. Comparisons with the results obtained from other laboratories demonstrated that the skillfulness of operators and detailed conditions for extraction could be the major reasons that induce significant analytical errors. Test results were certified by BAM and, therefore, the procedures and approaches used in this study may provide a standard reference for characterizing dioxins contained in sewage sludge.

Keywords: Soil Contamination, Dioxins, Sewage Sludge, Analysis Accuracy, Standardization