

Characterization of Polychlorinated Biphenyls (PCBs) from Soil and Sludge

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Polychlorinated biphenyls (PCBs) are a group of manufactured organic chemicals that contain different congeners. Although production of PCBs was banned by the Stockholm Convention on Persistent Organic Pollutants in 2001 due to their environmental toxicity, PCBs were widely used as coolants and lubricants in transformers, capacitors, and other electrical equipment worldwide especially in developed countries. Environmental contamination by PCBs remains one of big issues today because they are chemically stable and resistant to degradation in the natural environment. Characterization of PCBs from soil and sludge is typically difficult because of varieties of congeners together with strong adsorption of PCBs to soil organic matter. Referring to EN 16167: 2012, and using the samples provided by Federal Institute for Materials Research and Testing, BAM, this study examined the applicability of gas chromatography with electron-capture detection (GC-ECD) and gas chromatography with mass selective detection (GC-MS) for characterizing PCBs. In addition, a comparison between the results obtained by using different columns, specifically, DB-5MS and HT8-PCB was made to investigate potential effects from the column being used. The results demonstrated that both GC-ECD and GC-MS can be used to analyze PCBs with an acceptable accuracy. Analytical values of concentrations of different congeners, specifically, TrCB#28, TeCB#52, PeCB#101, PeCB#118, HxCB#138, HxCB#153, HpCB#180, are dependent on analytical approach due to the differences in standard materials being used and potential interference between different congeners. Compared with the analytical approach, the effects of column are negligible. Test results were certified by BAM and, therefore, the procedures and approaches used in this study may provide a standard reference for characterizing PCBs in both soil and sludge.

Keywords: Soil Contamination, Polychlorinated Biphenyls, Analysis Accuracy, Soil, Sludge