LETTERS TO THE EDITOR

Comments on “Organic Pollutants in Leachates from Landfill Sites”

In a recent Journal of Environmental Quality article, the organic chemical analysis of leachates from several municipal landfills was reported (Sawhney and Kozloski, 1984). The authors described testing for two classes of compounds using gas chromatographic techniques. They classified these as the “volatile” and “nonvolatile” fractions. It is clear from examining the analytical methodology used that these two fractions are functionally defined by the relative volatility of the compounds and the conditions necessary for gas chromatographic analysis. However, the use of the term “nonvolatile” to describe the compounds detected in this analysis is misleading and incorrect. Phenol, for example, is a relatively volatile compound. It has a vapor pressure of 0.2 mm of mercury at 20°C (Verschveren, 1977) and can be readily analyzed by gas chromatography at relatively low temperatures. Perhaps a more appropriate term for this fraction would be “nonpurgeable” or “semivolatile.”

In general, the term “nonvolatile” is reserved to describe those organic chemical pollutants that cannot be analyzed using standard gas chromatographic techniques. The leachate samples analyzed by Sawhney and Kozloski are likely to have contained “nonvolatile” organic compounds. In fact, nonvolatile organic compounds often represent the bulk of the dissolved organic carbon in leachate samples. These “nonvolatile” compounds may include natural products such as humic and fulvic acids, oxygenated metabolites of organic chemical pollutants such as petroleum hydrocarbons, and various industrial chemicals which, due to their polarity, are difficult to analyze by gas chromatography. Many organic compounds that can be classed as “nonvolatile” may be serious threats to public health if found contaminating groundwater. Considerable research is needed to identify appropriate testing protocols for the “nonvolatile” compounds. The test methods used by the authors should not be confused with them.

Sawhney and Kozloski also report the presence of tetrahydrofuran in three of their leachate samples. In one sample they suggest that its presence is evidence of the presence of industrial wastes. This conclusion should be approached with caution. I have found that the occurrence of tetrahydrofuran in groundwater samples is often an artifact.

Polyvinyl chloride (PVC) pipe is widely used for the installation of groundwater monitoring wells. The pipe is often joined in couplings with cement whose principal component is tetrahydrofuran. Even after the couplings are cured over a 5-min period and those that were not can be a source of THF contamination of water samples. The 7.5 m deep monitoring well site is based on the following. The 7.5 m deep monitoring well was constructed with cemented joints, I found tetrahydrofuran in some commercial technical bulletins.

In addition to the term “nonvolatile” being inappropriate for the compounds detected in this analysis, the degree of precision at which the concentration of volatile pollutants were measured and the actual percent recovery of phenols in the sample. Table 2 presents figures. In general, it is very difficult to measure organic chemical pollutants in water samples with high precision. The percent recovery of the phenols was less than 50%. A more useful piece of information is the actual percent recovery of an isotope added to the sample prior to solvent extraction. It is standard practice in many laboratories analyzing organic chemical pollutants by mass spectrometry.

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REFERENCES


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With regard to Potter’s comment on our use of the terms “volatile” and “nonvolatile” organic pollutants, we have arbitrarily used these terms for the organic compounds that were purged from the landfill leachates by a stream of helium over a 5-min period and those that were not are referred to as “nonpurgeable.” This conclusion should be approached with caution. I have found that the occurrence of tetrahydrofuran in groundwater samples is often an artifact.