



An Introduction to U.S. EPA's Next Generation of Leaching Testing

Leachability is the primary performance parameter regarding the potential release of a constituent of concern from a material in the context of the anticipated disposal or utilization conditions.

In environmental assessments, leaching is the process to transfer constituents from solid materials such as waste, soil, sludge, sediment, combustion residues including coal combustion residues (CCR), stabilized materials, construction materials, and mining wastes to a contact liquid. The extent to which constituents in the solid phase will transfer to the liquid phase will be dependent on many factors. Some of these factors include the specific physical, chemical, and biologic conditions of the material, constituents of concern, the leaching fluid as well as the exposure time.

U.S. EPA's Leaching Environmental Assessment Framework (LEAF)

U.S. EPA's Office of Resource Conservation and Recovery developed LEAF as a set of non-regulatory leaching methods that provide a means of generating more field-realistic leaching data that could be used in planning or decision-making processes. The sources for these methods are from published leaching methods and international standards with additional collaboration between Vanderbilt University and the Energy Research Centre of the Netherlands and DHI in Denmark.

The LEAF methods are a suite of four leaching tests, three of which are batch tests and one is a dynamic test. The LEAF test method takes into consideration the factors of pH, liquid/solid ratio as well as the granular, compacted, or monolithic form of the material. LEAF test methods are a tiered and flexible testing approach which increases in detail and complexity depending on the purpose of the testing. Using a tiered approach can provide a project-specific design which may be more realistic of the site conditions but can require significantly more testing.

The choice of the leaching tests depends on the design of the test procedure as well as how the analytical results are to be interpreted; no single leaching test is applicable for all purposes.

“...any material exposed to contact with water will leach components from its surface or its interior depending on the porosity of the material considered.”

– Leaching Assessment Research Group at Vanderbilt University

Existing Leaching Methods

In the management of waste materials, it is critical to assess the potential for organic and inorganic constituents to leach from a source material into the environment.

In 1990, U.S. EPA promulgated the revised Toxicity Characteristic, which includes **Toxicity Characteristic Leaching Procedure (TCLP)** in 40 CFR Part 261.24 as U.S. EPA's SW-846 Method 1311. TCLP is still the promulgated testing procedure to determine if a material is hazardous based on its toxicity characteristics. There are no plans to replace or revise TCLP for its intended use.

Synthetic Precipitation Leaching Procedure (SPLP) is U.S. EPA's SW-846 Method 1312, which is designed to estimate the mobility/leachability of both organic and inorganic constituents of potential interest in liquids, soils, and wastes in a mono-disposal situation caused by acid rain.

There has been a developing concern that TCLP or SPLP would be utilized outside of the intended use by users unfamiliar with the limitations of the data.

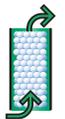
The LEAF Methods are:



1313

EPA Method 1313 – pH Dependence

Liquid-Solid Partitioning as a Function of Extract pH for Constituents in Solid Materials using a Parallel Batch Extraction



1314

EPA Method 1314 – Percolation Column

Liquid-Solid Partitioning as a Function of Liquid-to-Solid Ratio for Constituents in Solid Materials using an Up-flow Percolation Column Procedure



1315

EPA Method 1315 – Mass Transfer Rates

Mass Transfer Rates of Constituents in Monolithic or Compacted Granular Materials using a Semi-dynamic Tank Leaching Procedure

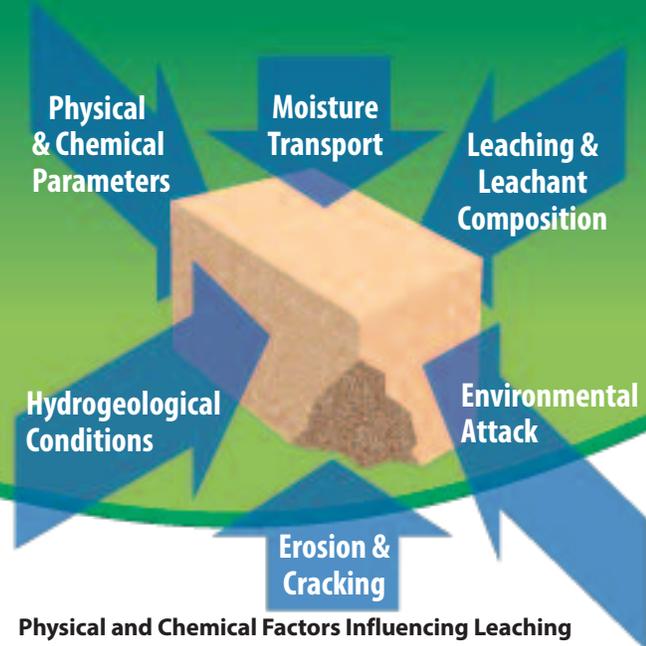


1316

EPA Method 1316 – Batch L/S

Liquid-Solid Partitioning as a Function of Liquid-to-Solid Ratio for Constituents in Solid Materials using a Parallel Batch Extraction Procedure

These four LEAF methods are the next generation of leaching and provide a considerably different data set than data obtained by TCLP and SPLP. The LEAF methods are a tool to assess the potential release of constituents of concern, which can reflect the actual environmental and management conditions of the material in the field.



Physical and Chemical Factors Influencing Leaching



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