

**WEACAU-III: International Workshop on
Environmental Aspects of Coal Ash Utilization**

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**Development of a Decision Support System for Applying the
Leaching Environmental Assessment Framework (LEAF) to
Beneficial Use and Disposal Decisions in the United States**

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Abstract

The Leaching Evaluation Assessment Framework (LEAF) is a set of four leaching test methods, data management tools, evolving coupled chemical speciation-based mass transfer models, and a decision framework that can be used for screening evaluation of beneficial uses for specific waste materials and detailed, site-specific assessment when warranted. The goal of LEAF is to provide a tiered approach to leach testing and assessment that provides a common basis for estimating source terms for constituent leaching for a wide range of materials, engineered uses and disposal, and location-specific scenarios. Joint, coordinated development of LEAF is occurring in the United States and the European Union.

The four LEAF leaching test methods include (i) pH dependent leaching, (ii) percolation column leaching, (iii) monolithic or compacted granular mass transfer rate, and (iv) batch liquid-to-solid (L/S) dependence leaching. Validation of these four test methods was completed in 2012 and these methods are currently being incorporated into USEPA SW-846 as Methods 1313, 1314, 1315 and 1316, respectively. Analogous procedures to the LEAF methods exist as technical specifications within the CEN methods standardization framework. Data management tools developed for use with the methods include method-specific data input templates and data management tool, LeachXS Lite (both freely available at <http://vanderbilt.edu/leaching>). LeachXS Lite assists in the storage and comparison of data and allows for facilitated reporting through graphing and exporting capabilities.

Extensive testing of coal combustion residues (CCRs) has been conducted to understand the effects of coal type and different air pollution controls on the resulting CCR characteristics, including total content, leaching and radioactivity. Samples of more than 40 fly ashes, 20 flue gas desulfurization (FGD) gypsums, multiple other FGD residues (e.g., scrubber sludges without oxidation or with inhibited oxidation) and “as managed” materials (e.g., blended CCRs) have been evaluated. Leaching data based on LEAF testing and total content analyses are available in a LeachXS Lite database.

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Decision algorithms were developed so that results of the LEAF test methods can be used directly for screening assessment purposes on a national or regional basis for beneficial use or disposal scenarios. Testing results also can be utilized in conjunction with geochemical speciation and reactive mass transfer models for more detailed site-specific assessment and verified with laboratory and field performance evaluations¹.

This presentation will include an overview of CCR testing results, interlaboratory validation of the LEAF test methods, and development of the decision framework for beneficial use and disposal scenarios.

¹ Geochemical speciation and lab-to-field comparisons will be discussed at this workshop in H.A. van der Sloot and D.S. Kosson, *Geochemical speciation of coal combustion residues and field observations in relation to beneficial use in construction applications*.