

A COMPREHENSIVE CHEMICAL CHARACTERIZATION TO PREDICT
ENVIRONMENTAL IMPACT FROM LEACHATE GENERATION¹

by

David J. Hassett²

Abstract. Understanding and predicting the nature of chemical phenomena associated with disposed materials is dependent on a thorough scientifically valid characterization of those materials. Key in this is the chemical characterization often, unfortunately, thought of as a chemical analysis. Although a chemical analysis is important in chemical characterization, it is only one small piece in an array of information required for true understanding. Other necessary information in a material characterization are the mineralogical, physical, and chemical characterizations consisting of bulk major, minor, and trace analyses, as well as a complete leaching characterization. This paper describes a scientifically sound approach toward material characterization with an emphasis on chemical phenomena. The research plan is generic in that it applies an approach which is scientifically sound that can be related to field conditions.

A detailed experimental plan was designed to answer specific environmental concerns, such as those addressed in the Resource Conservation and Recovery Act (RCRA), and to identify and answer other potential concerns, such as leachate generation. The specific goals of the chemical characterization were to:

- Identify elements of environmental significance, to include currently regulated elements and others present at potentially problematic concentration levels.
- Determine the total amounts of all identified trace elements in solid materials included in the study.
- Measure the leachability of the identified trace elements using regulatory leaching tests as well as other appropriate leaching tests, including long-term leaching.

Although actual field leachate concentrations cannot always be accurately predicted using this or any other existing characterization protocol, there are several important environmental questions that are answered using this approach. These are:

1. What are the absolute masses of potentially problematic elements present in the waste material?

¹Paper presented at the 1992 9th Annual National Meeting of the American Society for Surface Mining and Reclamation Meeting, Duluth, MN, June 14-18, 1992.

²David J. Hassett is Director of Applied Chemistry and Analytical Research, Energy and Environmental Research Center, University of North Dakota, Grand Forks, ND 58202.

2. What amount or percentage of this mass of material is likely to leach in the short term?
3. Are there any mineralogical transformations that will occur upon long-term contact of the waste with water that will affect the leachability of specific trace elements?

This protocol was developed for the characterization of reactive high-volume wastes such as low-rank coal ash and residues from advanced coal combustion processes. The concepts in this laboratory protocol could be applied to the characterization of any waste material.

The paper that follows presents an example of how this characterization protocol was applied to three coal combustion wastes.

This manuscript was unavailable for inclusion in the published proceedings. A copy of the paper is available by contacting the author at the Energy and Environmental Research Center, University of North Dakota, Box 8213, University Station, Grand Forks, North Dakota 58202. Phone: (701) 777-5000.