

PREFACE

PERFORMANCE OF BOROSILICATE GLASS HIGH-LEVEL WASTE FORMS IN DISPOSAL SYSTEMS

EDWARD J. HENNELLY

*E. I. Du Pont de Nemours, Savannah River Laboratory
Waste Technology Coordination, Aiken, South Carolina 29808-0001*

Received December 18, 1985

Accepted for Publication December 18, 1985

The Defense High Level Waste Leaching Mechanism Program was a 3-yr multiple laboratory cooperative research program conducted during fiscal years 1982 through 1984 and sponsored by the U.S. Department of Energy's (DOE's) High Level Waste Technology Program Office at Savannah River. The papers that follow were prepared as part of the Leaching Mechanism Program and were presented in part at a workshop held at DOE headquarters in Germantown, Maryland, on September 18 and 19, 1984.

The objective of the Leaching Mechanism Program was to determine the dominant leaching mechanisms for defense waste glass and to evaluate the effects of some of the major potential environmental parameters upon leaching mechanisms.

The participants reached a consensus that solubility of the leached glass species, particularly solubility in the altered surface layer, is the dominant factor controlling the leaching behavior of defense waste glass in a system in which the flow of the leachant is constrained, as it will be in a deep geologic repository. Also, once the surface of waste glass is contacted by groundwater, the kinetics of establishing solubility control are relatively rapid. The concentrations of leached species reach saturation or steady-state concentrations within a few months to a year at 70 to 90°C. Thus, reaction kinetics, which was the main subject of earlier leaching mechanism studies, is now shown to assume much less importance. The dominance of solubility means that the leach rate is, in fact, directly proportional to groundwater flow rates. Doubling the flow rate doubles the effective leach rate. This relationship is expected to obtain in most, if not all, repository situations.