DPST-82-648

VITRIFICATION OF INCINERATOR ASH-II CORROSION OF MELTER COMPONENTS (U)

Key words
Waste disposal
Frit
Alpha waste

by

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An internal report being submitted for release
to answer a request from E&G Idaho

TECHNICAL DIVISION
SAVANNAH RIVER LABORATORY

MEMORANDUM

June 16, 1982

TO: M. J. PLODINEC

FROM: W. N. RANKIN

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INTRODUCTION AND SUMMARY

At the request of the Waste Disposal Technology Division, the Chemical Technology Division is investigating vitrification of alpha waste incinerator (AWI) ash. The first tests carried out showed that up to 50 wt% ash could be dissolved in Frit 131 at 1150°C at an acceptable rate.[1]

This memorandum describes tests carried out to determine the corrosion rate of Monofrax K-3® and Inconel 690® at 1150°C in Frit 131 containing up to 50 wt% ash. The results of these tests indicate that adding up to 50 wt% incinerator ash to Frit 131 increases its corrosivity:

- Corrosion rate of Inconel 690® increased approximately 70% (to approximately 1.2 mils/day).
- Corrosion rate of Monofrax K-3® increased approximately 40% (to approximately 8.7 mils/day).

Optimization of a frit composition to minimize melter corrosion in ash glass production is recommended, if process feasibility tests at TNX are promising.

ADC: M. John Plodinec

DISCUSSION

Static laboratory corrosion tests of Inconel 690® and Monofrax K-3® were carried out at 1150°C in glasses composed of Frit 131 with up to 50 wt% alpha waste incinerator (AWI) ash.[2] The corrosion rates of Inconel 690® and Monofrax K-3® in pure Frit 131 in this test are in good agreement with similar samples from previous tests.[3]

The corrosion rates measured in this test are plotted against the ash content of the glasses in Figure 1. This plot shows that addition of ash to Frit 131 increases its corrosivity.

This is not surprising because the composition of the glass is being changed. The ash is composed of oxides such as CaO, MgO, and TiO_2 which would be expected to increase the fluidity of the glass (Table 1).[4] Less viscous glass should be more corrosive.

FRIT OPTIMIZATION

The corrosion rate in a glass melter for AWI ash should be minimized by using a frit composition that is tailored to the ash composition. I recommend that a frit optimization program be carried out with the ash,[5] if process feasibility tests at TNX indicate that further development is warranted.

QA/QOD

Precautions are routinely taken during glass contact corrosion testing to assure the quality of data:

- A certified analysis has been obtained for all alloys tested.
- The temperature of the test furnace is periodically checked using an independent measuring device.
- Measuring devices are periodically checked against standards.
- The frit used is from batch which has been previously analyzed.
- Specimens of glass are analyzed to assure proper mixing was achieved.
- Control specimens are included in each test.

WNR:pmc
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REFERENCES

1. W. N. Rankin, "Vitrification of Incinerator Ash - I, Dissolution Rate", DPST-82-389, March 26, 1982.

2. W. N. Rankin, "Corrosion of Melter Materials - I, Static Tests at 1150°C in Air," DPST-81-344, March 26, 1981.

3. W. N. Rankin, "Corrosion of Melter Materials - III, Effect of Na_2O," DPST-81-933, February 16,1982.

4. M. J. Plodinec, "Viscosity of Glasses Containing Simulated Savannah River Plant Waste", DP-1507, August 1978.

5. P. D. Soper, "Optimization of Frit Composition for SRP Nuclear Waste Glass", DPST-82-268, March 8, 1982.

FIGURE 1
EFFECT OF INCENERATOR ASH ON CORROSION RATE

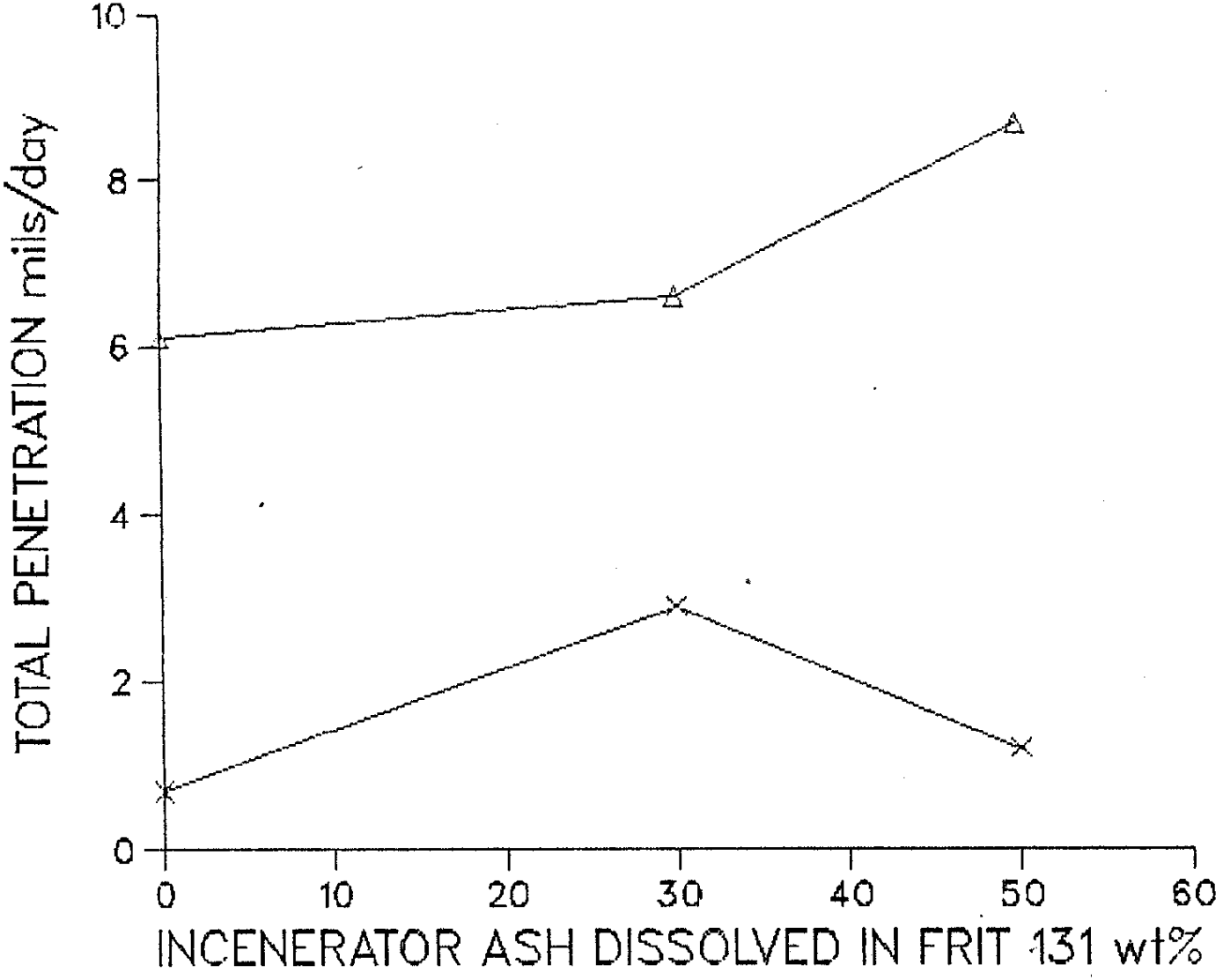

TABLE 1

Elemental Composition of ICTF Ash[a,b]

Element	Weight Percent (Average)
* Ca	48
* Ti	38
* Mg	6.5
* Al	3.4
* Cl	3.0
* Na	0.36
* K	0.13
* Sr	0.055
** Si	0.027
* Zn	0.016
* Mn	0.012
** P	0.0063
* Sb	0.0048
** Ba	0.0045
* V	0.0034
** Fe	0.0022
* W	0.0018
* Cr	0.0017
* As	0.0017
* La	0.00074
** Pb	0.00042
* Au	0.000069
* Dy	0.000017

a. Excluding carbon, oxygen, and nitrogen.
b. Runs 24, 27, 30-31, 34.
* Neutron activation analysis (NNA).
** Inductively coupled plasma-emission spectroscopy (ICP).

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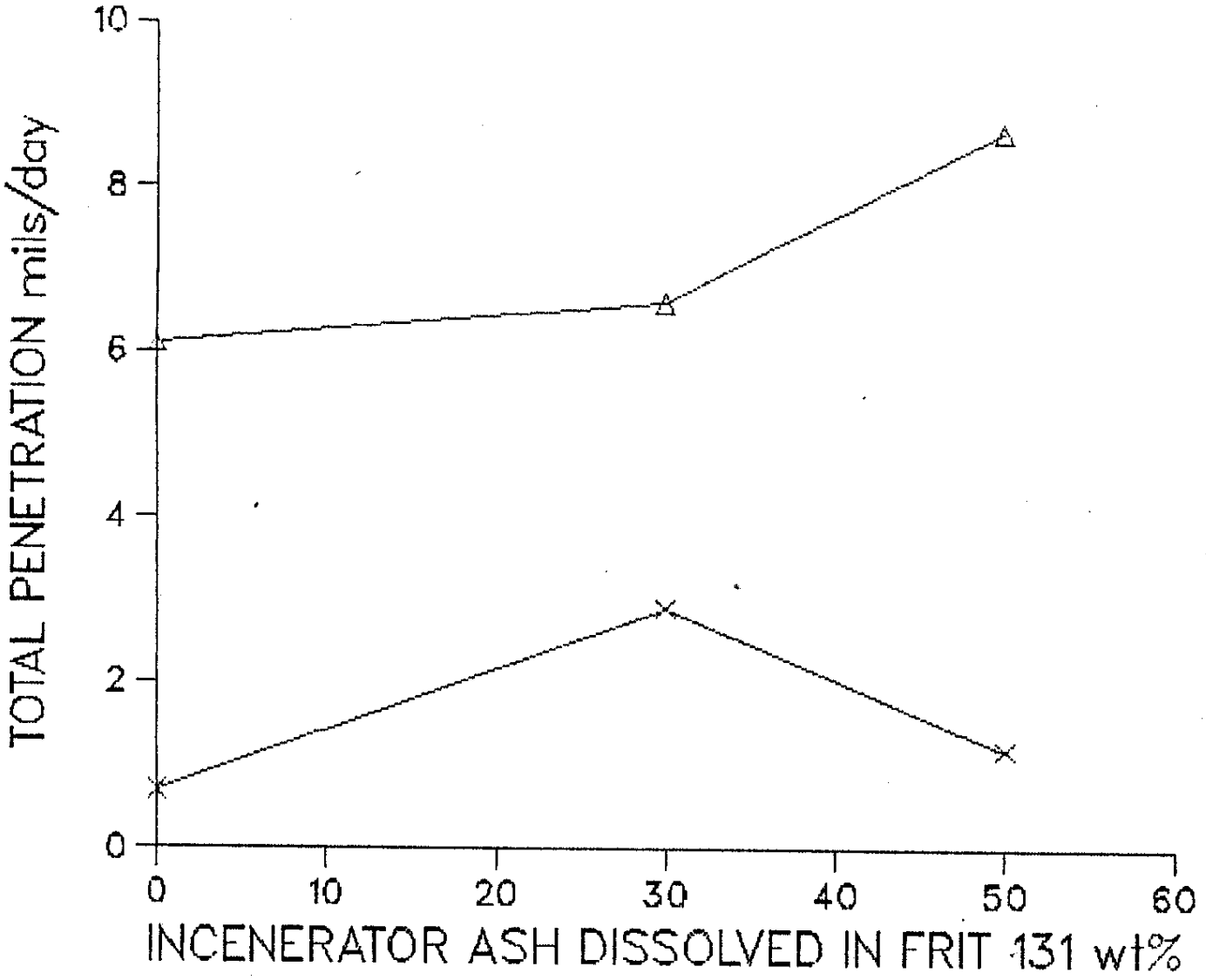

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