

RECEIVED

JUL 30 1998

ADH/ED/CP - 95729

CONF-980452--

**Pilot-Scale ~~OST~~ Equipment Development
For Pyrochemical Reduction of Spent Oxide Fuel***

by

S.D. Herrmann, R.W. King, K.R. Durstine, and C.S. Eberle

Engineering Division
Argonne National Laboratory-West
P. O. Box 2528
Idaho Falls, Idaho 83403-2528

The submitted manuscript has been created by the University of Chicago as Operator of Argonne National Laboratory ("Argonne") under Contract No. W-31-109-ENG-38 with the U.S. Department of Energy. The U.S. Government retains for itself, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in said article to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

To be Submitted for Presentation at
22ND Annual Actinide Separations Conference
in
Chattanooga, TN
April 20 - 23, 1998

MASTER *for*

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

*Work supported by the U.S. Department of Energy, under Contract W-31-109-ENG-38.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

**Portions of this document may be illegible
electronic image products. Images are
produced from the best available original
document.**

PILOT-SCALE EQUIPMENT DEVELOPMENT FOR PYROCHEMICAL REDUCTION OF SPENT OXIDE FUEL

by

S. D. Herrmann, R. W. King, K. R. Durstine, C. S. Eberle

Argonne National Laboratory-West
P.O. Box 2528
Idaho Falls, ID 83403-2528

Argonne National Laboratory (ANL) has developed and is presently demonstrating the electrometallurgical conditioning of sodium-bonded spent metal fuel from Experimental Breeder Reactor II, resulting in uranium, ceramic, and metal waste forms. Equipment is being developed at ANL which will precondition irradiated oxide fuel and demonstrate the application of electrometallurgical conditioning to such non-metallic fuels as well.

The oxide reduction process preconditions irradiated oxide fuel such that uranium and transuranic (TRU) constituents are chemically reduced into metallic form via a molten Li/LiCl-based reduction system. In this form the spent fuel is further conditioned in an electrorefiner and waste handling equipment, thereby placing the uranium, TRU elements, and fissions products into stable forms suitable for placement in a long-term repository. Development of the Li/LiCl-based oxide reduction process has proceeded at lab- (nominally 50 grams of heavy metal (HM)) and engineering-scale (nominally 10-kg of HM) for unirradiated oxide fuel. This paper/presentation will describe the process and equipment design for scale-up from *lab-* and *engineering-scale* reduction of *unirradiated* oxide fuel in *gloveboxes* to *pilot-scale* (up to 100-kg of HM) reduction of *irradiated* oxide fuel in a *hot cell*.