

Immobilization of Organic Radioactive and Non-Radioactive Liquid Waste in a Composite Matrix

Final CRADA Report

Nuclear Engineering Division

About Argonne National Laboratory

Argonne is a U.S. Department of Energy laboratory managed by UChicago Argonne, LLC under contract DE-AC02-06CH11357. The Laboratory's main facility is outside Chicago, at 9700 South Cass Avenue, Argonne, Illinois 60439. For information about Argonne and its pioneering science and technology programs, see www.anl.gov.

DOCUMENT AVAILABILITY

Online Access: U.S. Department of Energy (DOE) reports produced after 1991 and a growing number of pre-1991 documents are available free via DOE's SciTech Connect (<http://www.osti.gov/scitech/>)

Reports not in digital format may be purchased by the public from the National Technical Information Service (NTIS):

U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Rd
Alexandria, VA 22312
www.ntis.gov
Phone: (800) 553-NTIS (6847) or (703) 605-6000
Fax: (703) 605-6900
Email: **orders@ntis.gov**

Reports not in digital format are available to DOE and DOE contractors from the Office of Scientific and Technical Information (OSTI):

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
www.osti.gov
Phone: (865) 576-8401
Fax: (865) 576-5728
Email: **reports@osti.gov**

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 UChicago Argonne, LLC, nor any of their employees or officers, 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 document authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, Argonne National Laboratory, or UChicago Argonne, LLC.

Immobilization of Organic Radioactive and Non-Radioactive Liquid Waste in a Composite Matrix

Final CRADA Report

prepared by
Artem V. Gelis
Nuclear Engineering Division, Argonne National Laboratory

October 4, 2016

**Non Proprietary
Final CRADA Report**

Date: 10/04/16

CRADA Number: C1201400.00

CRADA Title: "Treatment and safe disposal of liquid radioactive waste from the BN-350 reactor unit at the LRW Processing Facility, Kazakhstan "

CRADA Start/End Date: 10/24/2013 to 4/30/2015

Argonne Dollars: 210,000

Participant Dollars: in kind

Argonne PI: Art Gelis

Participant(s):

Dennis Kelley in kind
Name Participant Dollars

Pacific World Trade Indianapolis, IN, USA
Complete Address

Name Participant Dollars

Complete Address

Name Participant Dollars

Complete Address

DOE Program Regina Carter NNSA GIPP
Manager:

Summary of Major Accomplishments:

The immobilization and disposition of organic radioactive and non-radioactive waste such as pump oil, spent solvent, and crude oil spills remain a significant challenge for chemical and nuclear industries. With funding from a NNSA Global Initiative for Proliferation Prevention (GIPP) project, a treatment technology for liquid organic radioactive waste generated at a BN-350 fast neutron reactor facility in Kazakhstan has been developed. As a result of data collected and analyzed during this project by Kazakh and DOE scientists, a novel, inexpensive method to dispose of the organic waste in a very hard matrix, suitable for long-term storage has been discovered. The method involves binding the liquid waste

Summary of Major Accomplishments:

with Nochar™ 910 polymer (aka PetroBond), followed by mixing it with an inorganic filler and molecular sulfur – a waste stream of the oil refining industry. Using a hot pressing technique, the mixture hardens after a short-time at an elevated temperature and a solid waste form is generated. The organic waste content in the final form can reach up to 60 wt. % with a compressive strength of about 100 kg/cm². If a harder form is required, then the organic content can be decreased to 25-30%, while the compressive strength increases up to 300 kg/cm². The oil-leaching rate is within 3 .10⁻⁶ – 2 .10⁻⁷ g/cm² .day range.

Summary of Technology Transfer Benefits to Industry:

This part remains uncertain at this point.

Other Information/Results: (Papers, Inventions, Software, etc.)

One patent application was submitted by ANL.

DOE-EM expressed certain interest in this technology . The technology could be used within the DOE complex or by the nuclear industry in general. Several applications have been discussed, however no funds have been received yet for future R&D.



Nuclear Engineering Division
Argonne National Laboratory
9700 South Cass Avenue, Bldg. #205
Argonne, IL 60439

www.anl.gov



Argonne National Laboratory is a U.S. Department of Energy
laboratory managed by UChicago Argonne, LLC