Research Participation Program
U.S. Environmental Protection Agency
Office of Research and Development
National Risk Management Research Laboratory
Cincinnati, Ohio

Project No #: EPA-ORD/NRMRL-LRPCD-2009-02

A faculty and/or postdoctoral research training opportunity is currently available at the U.S. Environmental Protection Agency (EPA) National Risk Management Research Laboratory (NRMRL) in Cincinnati, Ohio.

Project Description: The National Risk Management Research Laboratory is launching a collaborative research effort looking at safe management practices for secondary aluminum processing (SAP) wastes. Several landfills in the U.S. have had significant problems with the landfilling of this material such as subsurface fires, excessive subsidence and slope instability, engineering component failure, leachate outbreaks, gas collection and management efficiency problems, hazardous emissions, and dangerous working conditions on site for personnel. NRMRL is seeking to better understand this material, its potential to react, the means of preventing, arresting, or exhausting such reaction potential, and its behavior in the landfill environment. It is expected that inroads will be made towards the creation of new technologies whereby SAP waste can be safely deposited in landfills, avoiding future problems.

Specific Tasks: The selected individual will be trained by NRMRL staff and to assist in coordinating and carrying out the following specific tasks:

- *Field sampling of SAP waste*: Secondary aluminum smelters are concentrated within specific geographic areas within the United States. These areas include the Pacific Northwest, the Ohio Valley, and Texas. Field samples will be obtained from landfills which currently accept SAP waste materials, specifically within the Ohio Valley and USEPA Region 5 states. Samples will be taken from trucks transporting the material to the landfill, prior to unloading. These wastes will be transported to US EPA laboratories in Cincinnati for characterization and reactivity testing. The goal will be to obtain representative samples of most types of SAP wastes being landfilled. If it is not possible to get samples as they are received at landfills, such samples may be obtained from the generator directly. When requested, samples collected from a site will be split and shared with the landfill owner/operator.
- *SAP waste characterization*: Collected field samples will be analyzed to characterize their mineral and chemical composition. Analytical techniques to be used include X-ray diffraction (XRD), Fourier-transform infrared (FTIR) spectroscopy, thermogravimetric (TG) analysis, scanning electron microscopy (SEM), and total metals analysis. This information will be used to identify specific reactive components of the wastes and any other toxic/heavy metals of concern. Furthermore, identical analysis will be performed at the completion of reactivity analysis to potentially identify reaction mechanisms and

products. The characterization will be carried out in accordance with an EPA approved quality assurance project plan (QAPP)

- *Initial reactivity testing*: Some SAP samples will be tested for reactivity with water as well as landfill leachate. Landfill leachate is a complex matrix of organic and inorganic materials whose physical and chemical characteristics vary with factors including waste age, waste composition, and local climate. Therefore, parameters to be monitored include reaction temperature, gas emission of acetylene, hydrogen, carbon dioxide, carbon monoxide, methane, hydrogen sulfide, and ammonia, and time of reaction as indicated by the temperature profile. In each case, testing will be performed within test vessels purged with nitrogen gas to create anaerobic conditions typical of MSW landfills.
- After the SAP waste has undergone the reaction completely, the samples will be filtered. The liquids will be digested and analyzed for total metal content. XRD, FTIR, and TG analysis will be carried out on the solids.
- *Reactivity as a function of Moisture Content*: Some SAP waste samples will be tested in the presence of a simulated municipal solid waste mixture to examine the potential for combustion or pyrolysis of the waste mixture and the affects of moisture content on reaction initiation.
- *Reaction extinguishing agent testing* The reactivity experiments described in section d will be repeated with the addition of differing reagents to prevent the reaction. Examined mechanisms will include reaction inhibitors or reaction accelerants for pretreatement prior to disposal and reaction inhibitors for use with SAP already within a landfill. These reagents will be chosen based upon prior SAP waste characterization and reactivity testing and consultation with aluminum industry and landfill fire experts. A minimum of four reagents will be selected for testing.

Qualifications and Skills: Applicants must have received a doctoral degree within five years of the desired starting date or be a faculty member at an accredited U.S. college or university. Other applicants, including established scientists interested in new training activities, will be considered on a case-by-case basis. Applicants must possess a strong background in environmental chemistry. The successful candidate will lead a project on the behavior of wastes generated by the aluminum industry in municipal waste landfills. The candidate will be urged to develop and implement an experimental program to relate waste behavior to the landfill environment. The participant will also have the opportunity to prepare reports, publications and presentations. This project will also involve interaction with industrial partners as well as state and federal policymakers.

The program is open to all qualified individuals without regard to race, sex, religion, color, age, physical or mental disability, national origin, or status as a Vietnam era or disabled veteran. U.S. citizenship or lawful permanent resident status is preferred (but can also hold an appropriate visa status, however, an H1B visa is not appropriate).

The appointment may be full-time for one year and may be renewed for up to two additional years upon recommendation of NRMRL and subject to availability of funds. The participant will receive a monthly stipend. The participant must show proof of health and medical insurance. **The participant does not become an EPA employee.**

The postdoctoral participant will receive a monthly stipend up to $5,580. The faculty participant will receive a stipend commensurate with his/her university pay. Funding may be made available to reimburse the participant's travel expenses to present the results of his/her research at scientific conferences. No funding will be made available to cover travel costs for interviews, relocation costs, costs of tuition/school fees, or a participant's health insurance.

The Research Participation Program for EPA is administered by the Oak Ridge Institute for Science and Education. ***Please reference Project #EPA-ORD/NRMRL-LRPCD-2009-02 when calling or writing for information.*** For additional information and application materials contact: Research Participation Program/NCEA-RTP, Attn: Betty Bowling, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, Tennessee 37831-0117, Phone: (865) 576-8503 FAX: (865) 241-5219 e-mail: **betty.bowling@orau.org.**

An application can be found at www.orau.gov/orise/edu/EPA/app-gugrgpd.pdf