U.S. DEPARTMENT OF ENERGY

PNNL-15410-Add

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Thermal Behavior of As-Recovered (Unneutralized) Aspigel (Pressure Measurements)

RD Scheele

July 2010

Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by Battelle Since 1965

DISCLAIMER

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information,
P.O. Box 62, Oak Ridge, TN 37831-0062;
ph: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service,
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161
ph: (800) 553-6847
fax: (703) 605-6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm


This document was printed on recycled paper.
(9/2003)

PNNL-15410-Add

Thermal Behavior of As-Recovered (Unneutralized) Aspigel (Pressure Measurements)

RD Scheele

July 2010

Prepared for
the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Pacific Northwest National Laboratory
Richland, Washington 99352

Thermal Behavior of As-Recovered (Unneutralized) Aspigel (Pressure)

In Scheele et al.'s (2005) discussion on the thermal reactivity of as-recovered Aspigel provided the self-heat rate thermal behavior as measured by accelerating rate calorimetry (ARC) but did not provide the ARC-observed pressures during these experiments. This brief report supplements the earlier report by providing the measured pressures.

As described by Scheele et al. (2005), Fluor staff prepared the Aspigel by spraying it onto stainless steel that had been degreased using a degreaser containing butoxyethanol and sodium hydroxide and allowing the Aspigel to dry. Fluor staff provided PNNL 1) Aspigel which had dried for 24 h and had fallen onto the tarp covering the floor of the mock-up glovebox, 2) Aspigel dried for 24 h and recovered using a Shark vacuum, and 3) Aspigel dried for 24 h and recovered using a DataVac vacuum, and 4) Aspigel collected after drying 49 h. The first three Aspigel samples were analyzed by ARC to determine their thermal reactivity.

Supplementing and complimenting Scheele et al's (2005) Figure 5.61 that provided ARC-measured self-heat rates for as-recovered Aspigel samples, Figure 1 provides the ARC-measured pressure for each of the ARC-observed exothermic reactions. Figure 2 provides the ratio of the measured pressures and the ideal gas pressure predicted based on the first observed pressure and illustrates that the thermally initiated reactions produce gas; a ratio above 1 indicates that the amount of gas is greater than predicted assuming ideal gas behavior. Both Figure 1 and Figure 2 show that the gas production rate increases significantly near 100°C and then near 185°C where ceric ammonium nitrate begins to exothermically decompose (Scheele et al. 2005).

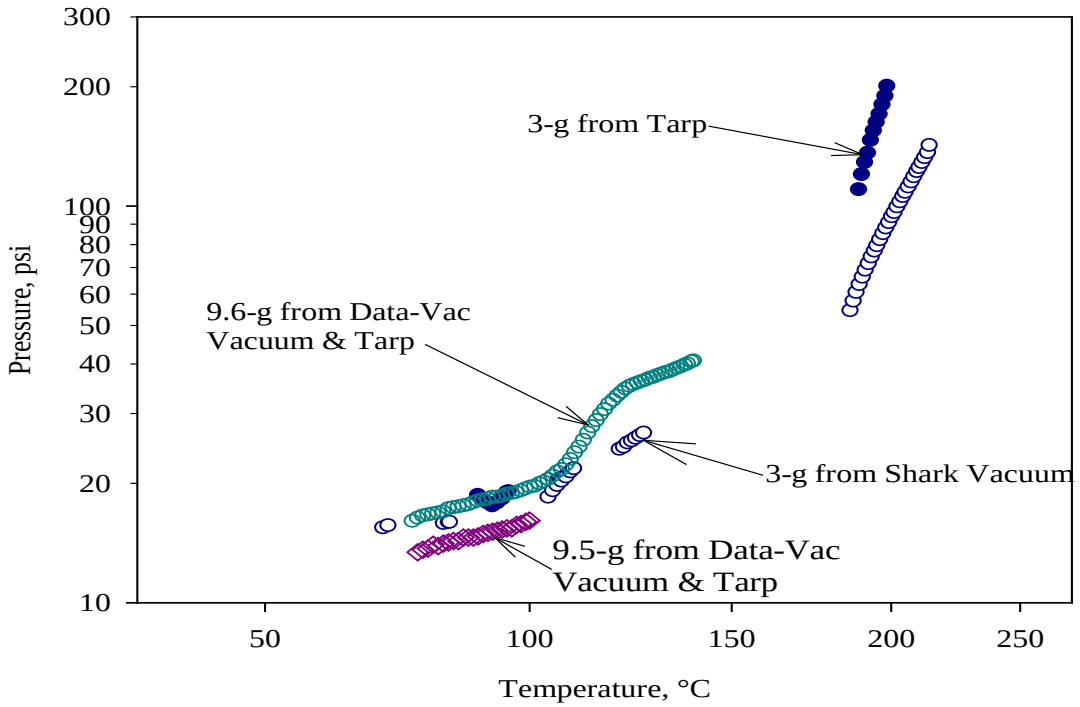

Figure 1. Arrhenius plot of ARC-measured thermal behavior of Aspigel (Pressure)

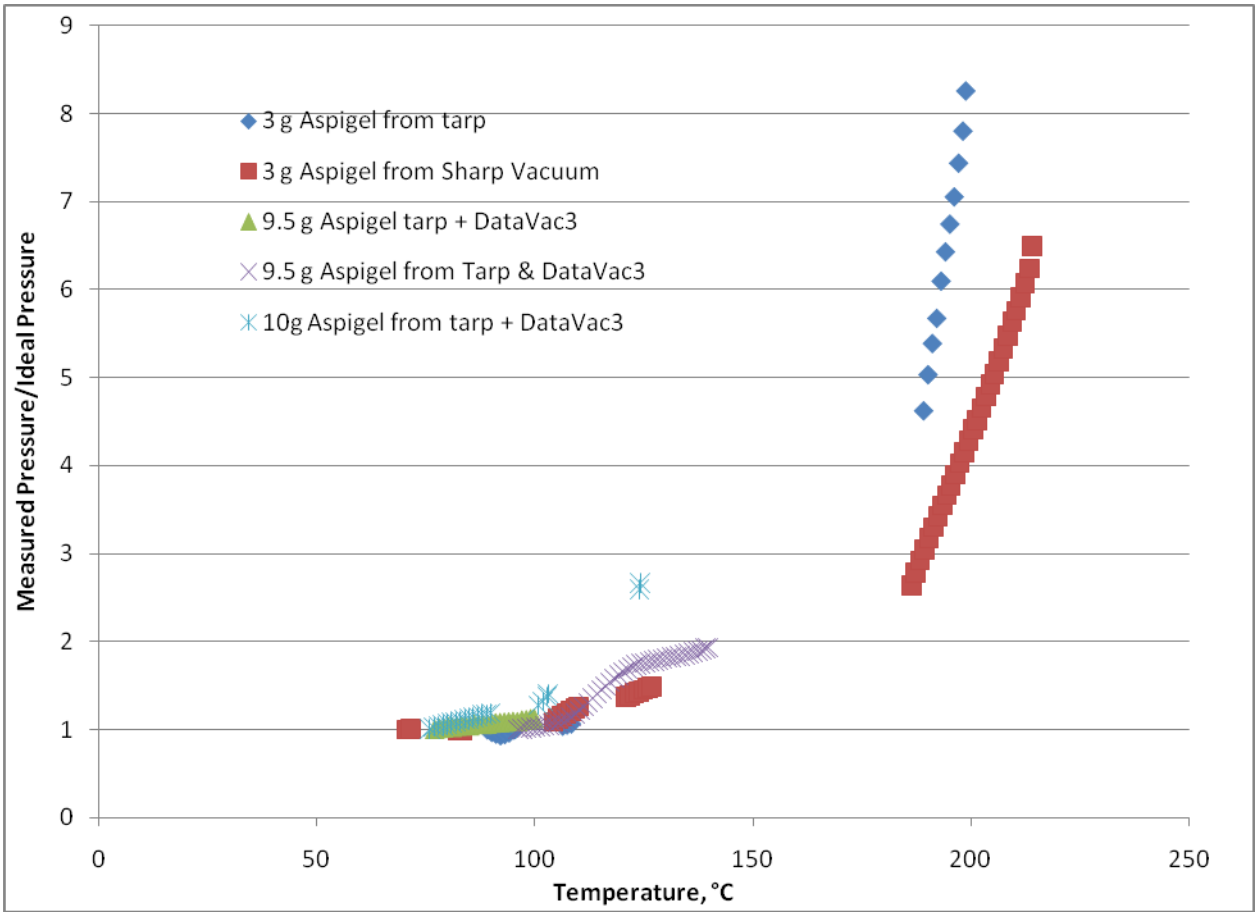

Figure 2. Ratio of measured and on ideal gas behavior-predicted pressures for Aspigel as measured by ARC

The pressures measured for the various as-recovered Aspigel samples in the ARC experiments, indicate that the exothermic behavior reported by Scheele et al. (2005) are gas producing reactions. The pressure does not change any of the previous conclusions.

References

Scheele, RD, TD Cooper, SA Jones, JR Ewalt. , JA Compton, DS Trent, MK Edwards, AE Kozelisky, PA Scott, and MJ Minette. 2005, "Thermal Stability Studies of Candidate Decontamination Agents for Hanford's Plutonium Finishing Plant Plutonium-Contaminated Gloveboxes." PNNL-15410. Pacific Northwest National Laboratory, Richland, Washington.