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Title: Summary of Remediated Nitrate Salt Surrogate Formulation and Testing

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memorandum

M-7: High Explosive Science and Technology

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Phone/Fax: 7-6718/7-0500
Symbol: M7-16-6063
Date: May 3, 2016

SUBJECT: Summary of Remediated Nitrate Salt Surrogate Formulation and Testing

Contributors: Geoff Brown, Phil Leonard, Ernie Hartline, Hongzhao Tian (M-7)

Introduction

High Explosives Science and Technology (M-7) completed all required formulation and testing of Remediated Nitrate Salt (RNS) surrogates on April 27, 2016 as specified in PLAN-TA9-2443 Rev B, "Remediated Nitrate Salt (RNS) Surrogate Formulation and Testing Standard Procedure", released February 16, 2016. This report summarizes the results of the work and also includes additional documentation required in that test plan. All formulation and testing was carried out according to PLAN-TA9-2443 Rev B. The work was carried out in three rounds, with the full matrix of samples formulated and tested in each round. Results from the first round of formulation and testing were documented in memorandum M7-16-6042, "Results from First Round of Remediated Nitrate Salt Surrogate Formulation and Testing." Results from the second round of formulation and testing were documented in M7-16-6053, "Results from the Second Round of Remediated Nitrate Salt Surrogate Formulation and Testing." Initial results from the third round were documented in M7-16-6057, "Initial Results from the Third Round of Remediated Nitrate Salt Formulation and Testing."

Materials

The materials used to formulate the RNS surrogates are listed in the table below. All chemicals were ordered through IESL-approved vendors using the Oracle iProcurement system. The Certificates of Analysis and packing slips for each item were scanned and documented in memorandum M7-15-6033, "Starting Materials Available for RNS Surrogate Formulation."

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Derivative Classifier: Geoffrey W. Brown, M-7
Date: May 2, 2016

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Table 1. Materials used for formulating RNS surrogates

Material	Lot Number
Aluminum nitrate nonahydrate	142299
Calcium nitrate tetrahydrate	144946
Chromium nitrate nonahydrate	F04Y024
Iron nitrate nonahydrate	A0355097
Water, LCMS grade	145280
Magnesium nitrate	147856
Sodium nitrate	144821
Lead nitrate	143996
Oxalic acid	143866 and 145400
Potassium carbonate	145088

sWheat pet litter was obtained commercially by LANL Environmental Programs and a 20 lb bag was supplied to M-7 per PLAN-TA9-2443 Rev B.

Formulation

The base RNS surrogate component is designated SFWB-8 and consists of the mixture listed in Table 2.

Table 2. SFWB-8 composition

Material	Weight %
$Al(NO_3)_3 * 9\ H_20$	3.20
$Ca(NO_3)_2 * 4\ H_2O$	12.72
$Cr(NO_3)_3 * 9H_2O$	0.16
$Fe(NO_3)_3 * 9H_2O$	4.86
$Mg(NO_3)_2 * 6H_2O$	35.69
$NaNO_3$	7.91
$(COOH)_2 * 2H_20$	2.89
K_2CO_3	1.51
Water	4.31

The final RNS surrogate formulations consist of SFWB-8 with lead nitrate and sWheat pet litter in the weight ratios shown in Table 3. Table 3 is the matrix tested in each round noted above.

In the discussions below, the samples will be designated with a shorthand notation of the form SFWB8-XX-Y, where XX is the sWheat percentage and Y is the Pb percentage. For example, SFWB8-15-1 is the mixture made using SFWB-8 with 15% sWheat and 1% Pb.

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Table 3. RNS surrogate formulation matrix. Weight percent values shown.

	Increasing sWheat ->		
Increasing Lead ->	4% $Pb(NO_3)_2$ 15% sWheat 81% WB-8	4% $Pb(NO_3)_2$ 25% sWheat 71% WB-8	4% $Pb(NO_3)_2$ 35% sWheat 61% WB-8
	2% $Pb(NO_3)_2$ 15% sWheat 83% WB-8	2% $Pb(NO_3)_2$ 25% sWheat 73% WB-8	2% $Pb(NO_3)_2$ 35% sWheat 63% WB-8
	1% $Pb(NO_3)_2$ 15% sWheat 84% WB-8	1% $Pb(NO_3)_2$ 25% sWheat 74% WB-8	1% $Pb(NO_3)_2$ 35% sWheat 64% WB-8

Formulation followed section 4.2 of PLAN-TA9-2443 Rev B with any relevant observations from the third round documented in the formulation notes in Appendix A of this report. Observations from previous rounds are documented in the memoranda noted above.

Testing

Details of all test methods are outlined in PLAN-TA9-2443 Rev B, Attachment B. The results of the tests are documented in M-7 Analytical Laboratory number 52279 (M-7-AC-52279). For tests carried out with the aid of control or analysis software, Software Quality Management documentation is included in Appendix B of this report. Adiabatic calorimetry notebook pages for the third round are in Appendix C.

In the first round of testing, Differential Scanning Calorimetry (DSC) data was acquired for each sample. After the first round was completed, the DSC data were evaluated by subject matter experts and it was determined that this test was not providing useful information about the RNS formulations. The data was not reproducible in replicate runs, making it impossible to say what the characteristic thermal features were for any given RNS formulation or to determine trends as a function of sWheat or Pb content. This was caused by the very small sample sizes required for the DSC used by M-7 (less than 3 mg) and the inhomogeneity of the RNS formulations. The amounts of the materials going into the formulations are not measured out finer than the 10 mg level due to granularity and the grinding step in the formulation procedure is not able to homogenize the samples well enough for the small sample sizes required by DSC. Based on these considerations and the corrosion that the RNS formulations were causing in the DSC cell, it was decided to discontinue DSC data acquisition for the second and third rounds of testing.

Drop Weight Impact (DWI) Testing

No RNS surrogates showed any impact sensitivity in any round of testing. Each one showed 15 consecutive No-Go responses when the test weight was dropped from 320 cm. Note that all internal standards showed expected behavior.

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Friction Testing

No RNS surrogates showed any friction sensitivity in any round of testing. Each one showed 15 consecutive No-Go responses with the largest weight at the full extent of the lever arm. Note that all internal standards showed expected behavior.

Electrostatic Discharge (ESD) Testing

The RNS surrogates showed some spark sensitivity in all rounds of testing but there were no trends with sWheat content or Pb content. Since the samples did not show any sensitivity to impact or friction, this spark sensitivity may be due to gases evolved from the sample. In the ESD sample holder, the sample is confined and any reactive gases are trapped until the probe needle discharges through the holder, causing any volatile head space to react. Note that all internal standards showed expected behavior.

Automatic Pressure Tracking Adiabatic Calorimetry (APTAC) Testing

APTAC testing measures the sample self-heating as it is heated adiabatically and step-wise in 2 ˚C increments (Heat-Wait-Search mode). Notebook pages from the third round of testing are documented below in Appendix C. Those pages also include the temperature and pressure verifications and instrument verification runs with di-tert butyl peroxide (DTBP) in toluene. Verifications were carried out before and after running the formulations in the test matrix. The CoA's for the toluene and the DTBP, obtained from IESL vendors, are also included in Appendix A.

Table 4 shows the temperatures of onset of self-heating for all 9 formulations for all three rounds of testing. The onset is defined as the temperature at which the sample self-heating rate exceeded 0.02 ˚C/min. The largest variability across nominally equivalent formulations is 8 ˚C. Averaging the temperature span of each cell produces a value of 5 ˚C. This average temperature span is used for error bars in Figure 1 where the average onset is plotted vs formulation.

Table 4. Temperatures of onset of self-heating for all 9 formulations in Table 2. Each cell contains onset temperatures from all three rounds of testing (rounds 1 to 3 ordered from top to bottom in each cell).

	15 % sWheat	**25 % sWheat**	**35 % sWheat**
4% Pb	42 ˚C 48 ˚C 50 ˚C	56 ˚C 56 ˚C 58 ˚C	64 ˚C 58 ˚C 56 ˚C
2 % Pb	48 ˚C 48 ˚C 44 ˚C	56 ˚C 56 ˚C 60 ˚C	60 ˚C 52 ˚C 58 ˚C
1% Pb	52 ˚C 48 ˚C 50 ˚C	52 ˚C 59 ˚C 54 ˚C	58 ˚C 54 ˚C 56 ˚C

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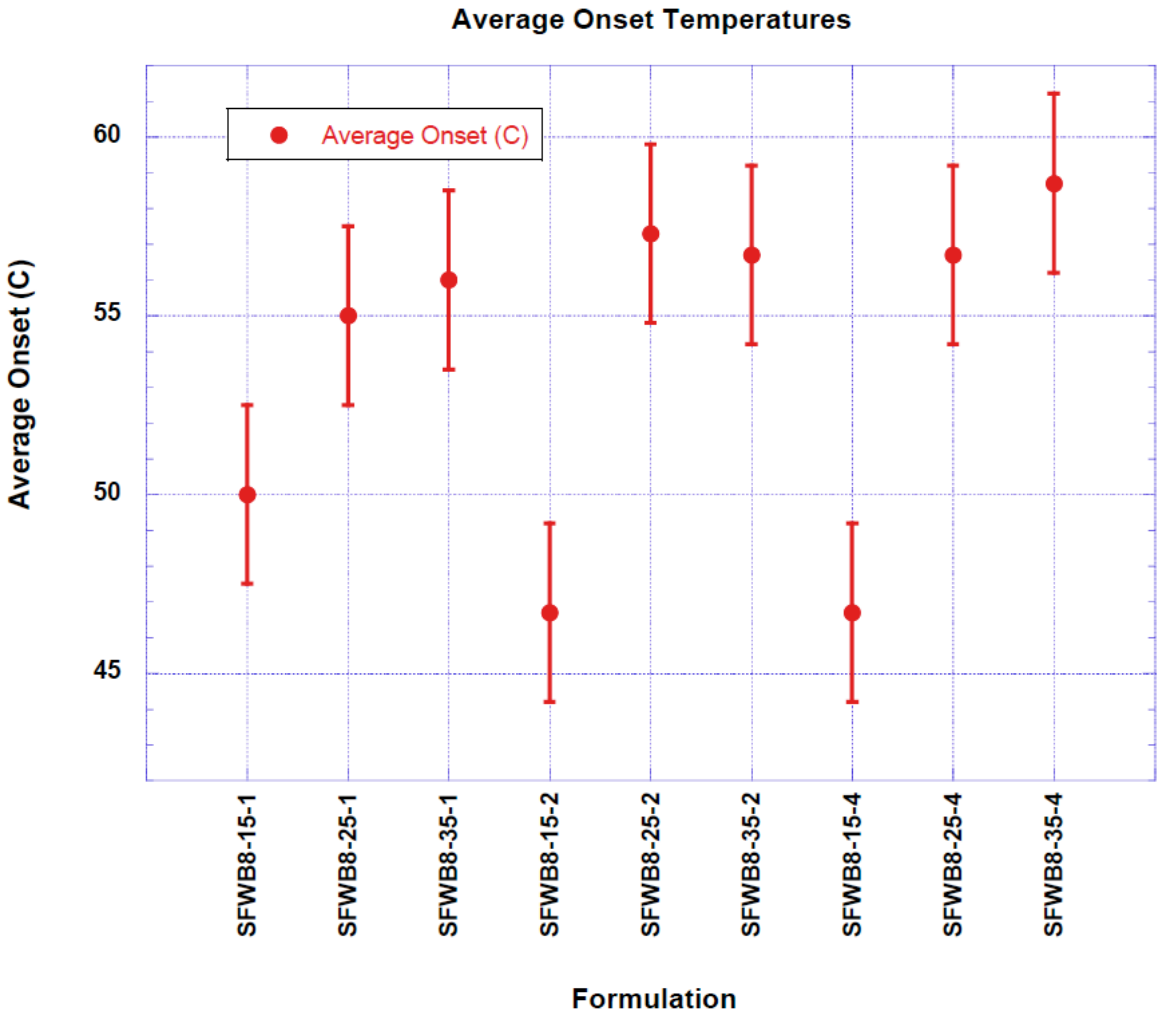

Figure 1. Average onset temperatures for all formulations. Error bars are the average measurement span of the cells in Table 4.

From Figure 1 it appears that the 15% mixtures have lower onsets than the other mixtures by at least 5 ˚C but that there is little variation with Pb content in any mixture and little variation between the 25% and 35% sWheat formulations.

Figures 2 through 4 show the heat flow traces for all formulations grouped by sWheat content. Each graph has results from all three rounds overlaid. The traces have been offset in time so that 0 minutes is the point at which self-heating was first detected. In this way it is possible to see the variability in the onset temperatures and the different rates at which self-heating progressed for each sample.

Examination of Figures 2 through 4 shows some traces that proceed from onset to rapid thermal runaway smoothly and some that go through one or more transitions – observed as a change in curvature and/or slope. There is no correlation between mixture type and the trace profile. The cases where the trace does show plateaus indicates that different reactions are dominating at different times either due to

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consumption of some reactants or the effect of different kinetic parameters. This is not surprising given the multicomponent nature of the mixtures. Based on this observation and the lack of correlation with mixture type, it is reasonable to assume that a set of nominally equivalent reactions is occurring in all of the mixtures at various times and with various levels of heat generation. In the mixtures that appear to be closer to a single smooth exothermic event, these reactions would overlap – the heat from one driving the next as the material thermally runs away.

Figures 2 through 4 also show a large amount of variability in the time to the most rapid thermal runaway for several of the mixtures. Examples are the 4% Pb mixtures in Figure 2, the 2% Pb mixtures in Figure 3, and the 2% Pb mixtures in Figure 4. The time to this final runaway does not appear to be correlated with the onset temperature. The variability also illustrates the inherent inhomogeneity in these multicomponent mixtures.

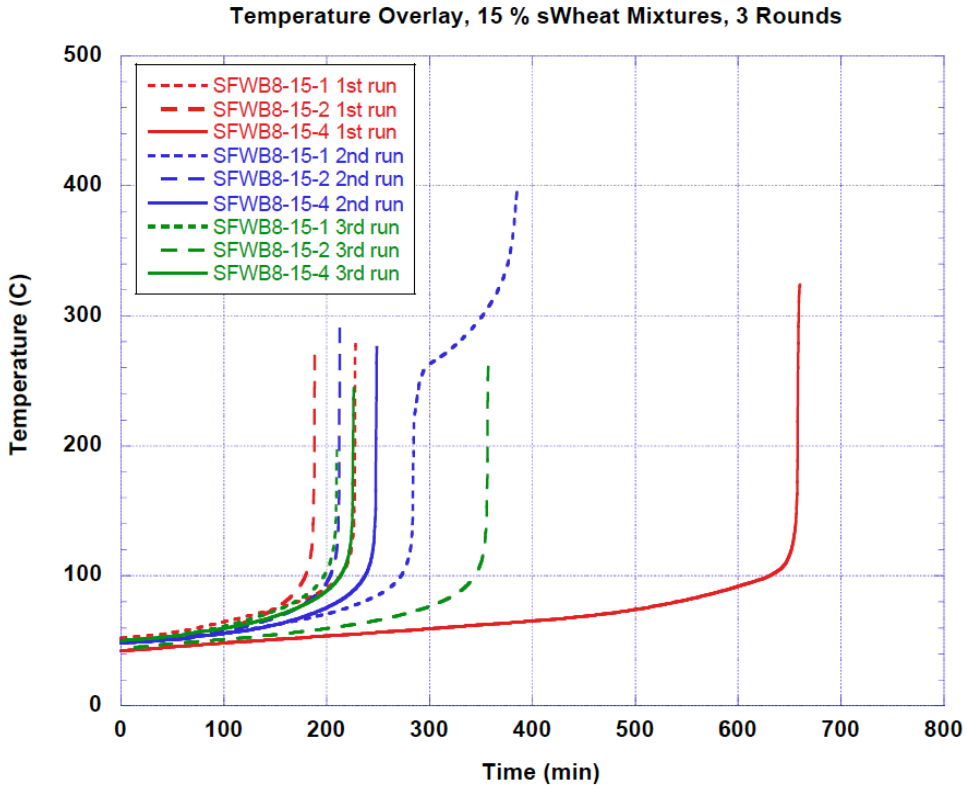

Figure 2. APTAC temperature vs time plots for all 15% sWheat RNS mixtures

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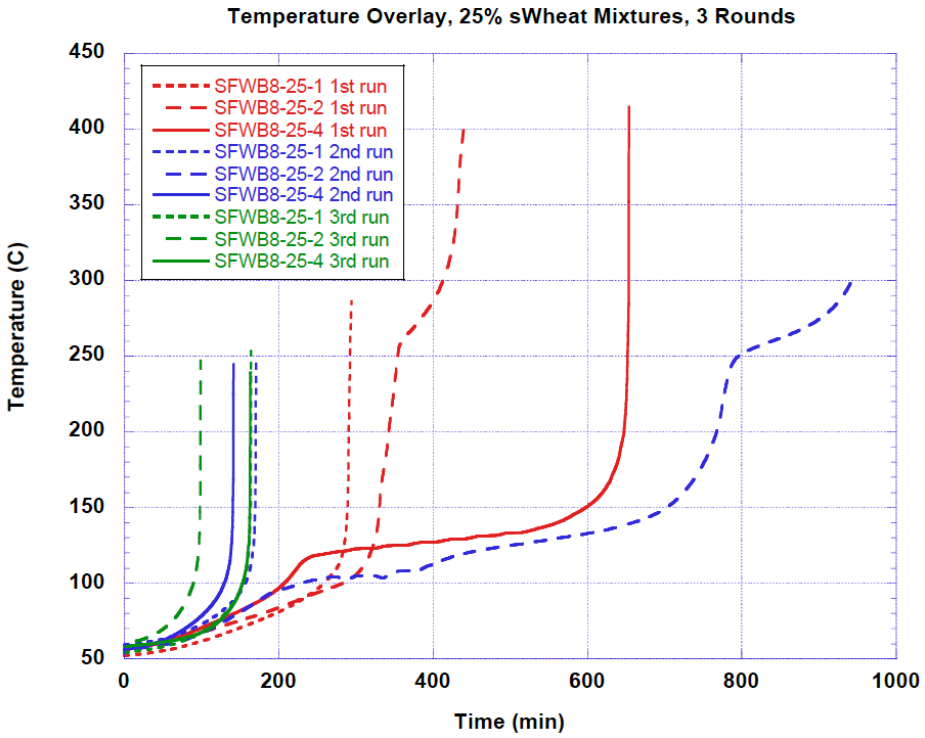

Figure 3. APTAC temperature vs time plots for all 25% sWheat RNS mixtures

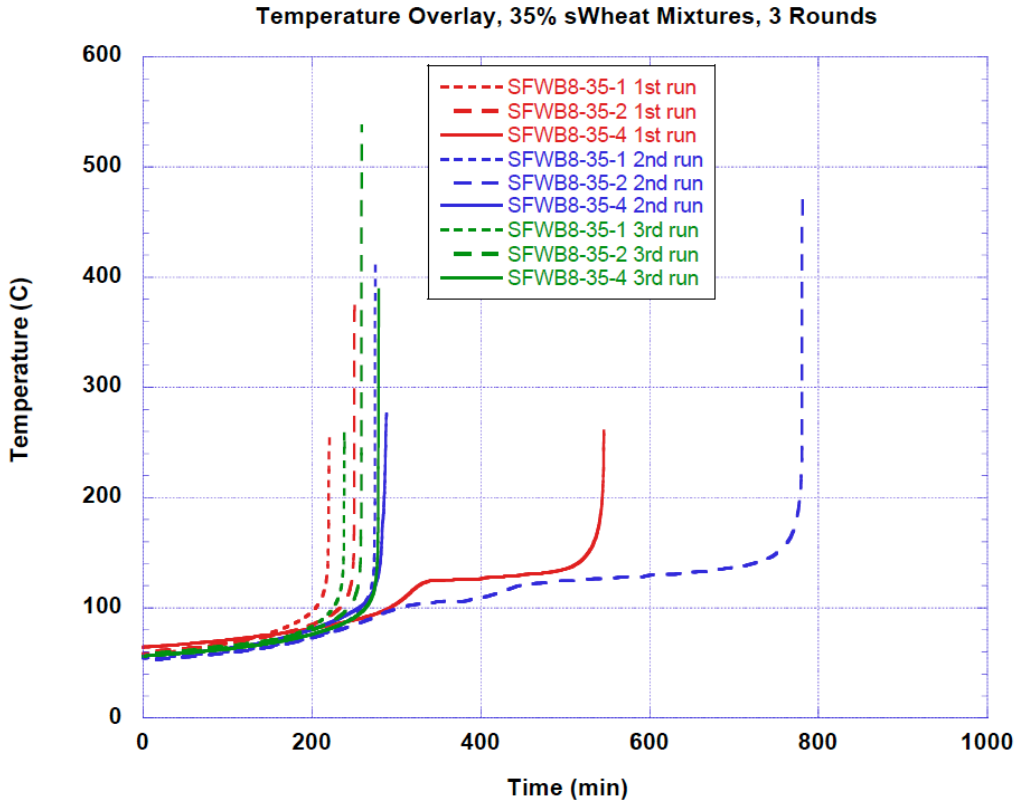

Figure 4. APTAC temperature vs time plots for all 35% sWheat RNS mixtures

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Figures 5 through 7 show the pressure traces associated with each heat flow trace in Figures 2 through 4. The curves have been offset in time in the same way that the temperature data were offset. The pressure traces also show contributions from different reactions as multiple dips, peaks, and slopes. In all cases, the most vigorous pressure generation corresponds to the fastest heat generation in the corresponding Figure above. Note that this does not either support or refute that the reactions are pressure-dependent. There is no way (in this test configuration) to determine whether the increase in pressure is driving the increase in temperature. The data would have a similar appearance if the pressure increase was the result of increased generation of gaseous products or simply due to the ideal gas law.

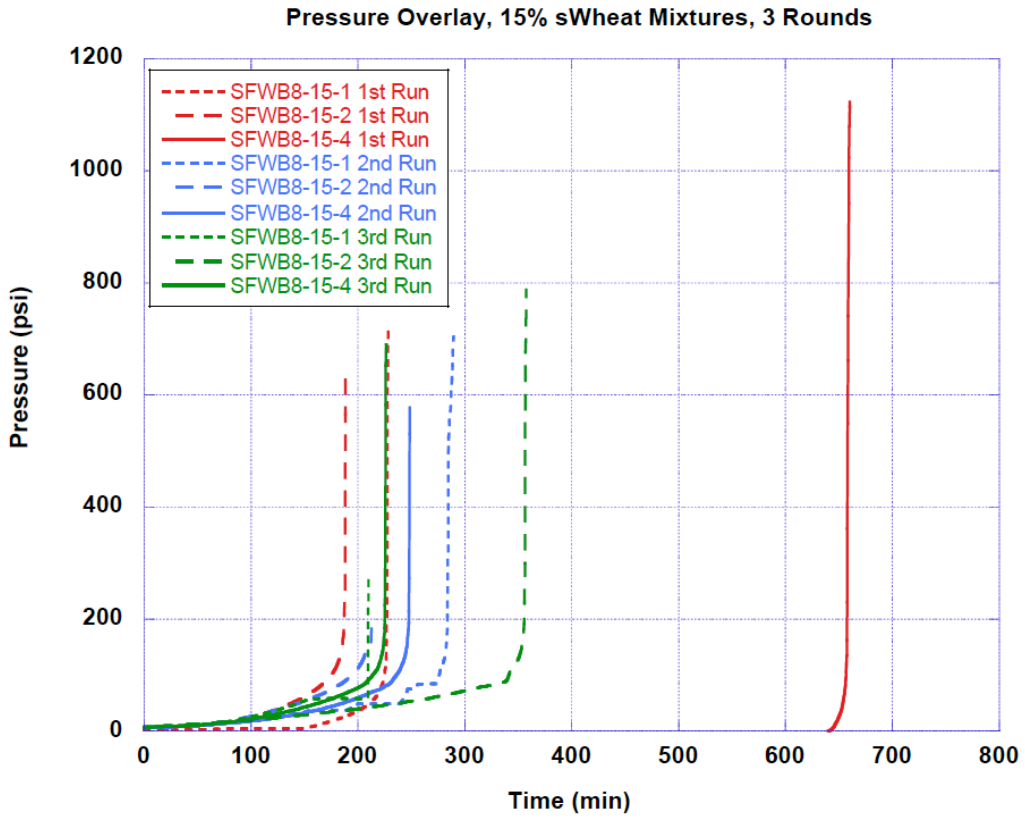

Figure 5. APTAC pressure vs time plots for all 15% sWheat RNS mixtures

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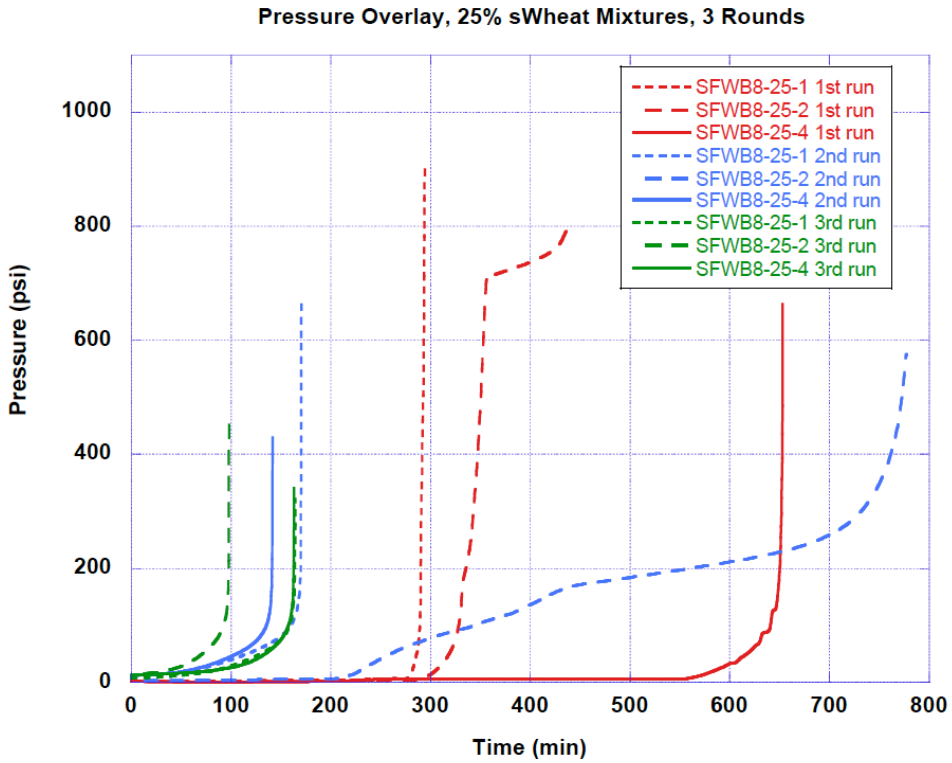

Figure 6. APTAC pressure vs time plots for all 25% sWheat RNS mixtures

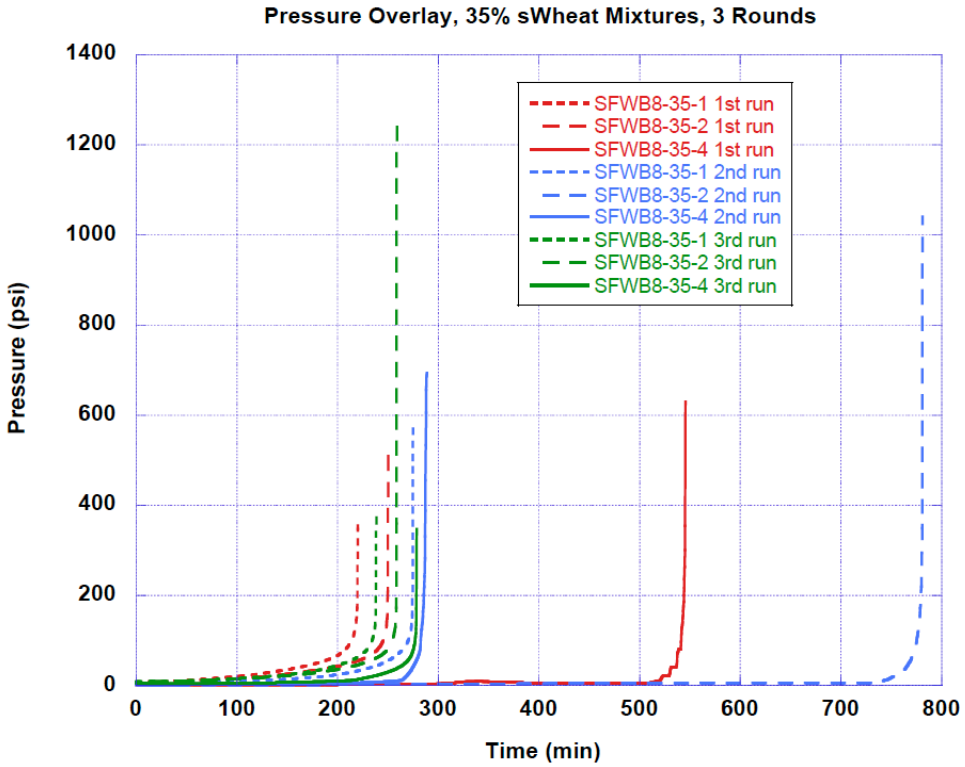

Figure 7. APTAC pressure vs time plots for all 35% sWheat RNS mixtures

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The self-heating segments from the APTAC runs were analyzed with vendor-supplied software to determine kinetic parameters. This analysis was less than robust for two reasons. First, all of the available models that can be fit to the data assume single reactions, but many of the data sets show slope changes or other features indicative of multiple reactions. Second, most of the initial self-heating segments drove the APTAC instrument to shut down due to a temperature, temperature rate, or pressurization rate limit being exceeded. As a result, these data sets do not include the heat generated through full completion of the reaction under adiabatic conditions, violating an assumption used for kinetic analysis.

In order to estimate the relative kinetics of the different compositions, all data sets were fit to a first order Arrhenius model with endpoints adjusted so that the resulting parameters best fit a maximal portion of the data set. This approach is somewhat subjective but does provide a relative comparison. The results of this approach are shown in Table 5 with results from all three rounds in each cell, ordered from top to bottom. The scatter in the data is apparent and reflects the experimental issues noted above as well as inhomogeneity of the samples. There are no obvious trends with sWheat or Pb content.

Table 5. Arrhenius kinetic parameters for the initial self-heating segments of the RNS surrogate formulations. "A" is the pre-exponential factor in log(1/s) and "E_a" is the activation energy in kJ/mol. Each cell contains kinetic parameters from all three rounds of testing (rounds 1 to 3 ordered from top to bottom in each cell).

SFWB8-15-4	SFWB8-25-4	SFWB8-35-4
A = 4.5, E_a = 63*	A = 5.4, E_a = 62	A = 8.3, E_a = 85
A = 11.1, E_a = 106	A = 9.7, E_a = 95	A = 6.4, E_a = 73
A = 7.1, E_a = 77	A = 7.3, E_a = 77	A = 8.2, E_a = 86
SFWB8-15-2	SFWB8-25-2	SFWB8-35-2
A = 9.4, E_a = 93	A = 12.1, E_a = 116	A = 8.5, E_a = 88
A = 6.4, E_a = 71	A = 11.8, E_a = 103	A = 8.1, E_a = 80
A = 7.9, E_a = 84	A = 7.3, E_a = 77	A = 7.7, E_a = 83
SFWB8-15-1	SFWB8-25-1	SFWB8-35-1
A = 11.9, E_a = 113	A = 11.2, E_a = 110	A = 11.0, E_a = 107
A = 9.7, E_a = 95	A = 9.9, E_a = 97	A = 12.6, E_a = 118
A = 9.5, E_a = 94	A = 7.7, E_a = 81	A = 7.8, E_a = 82

* SFWB8-15-4 results were reanalyzed for this report.

Summary

Nine RNS surrogate formulations were formulated and analyzed in triplicate per PLAN-TA9-2443, Rev B. Sensitivity testing showed all formulations were insensitive to impact and friction although most had some sensitivity to spark discharge. Comparison of APTAC data from all three rounds of testing showed no obvious trends with sWheat or Pb content with the exception that the 15% Swheat formulations exhibited self-heating onset temperatures that were about 5 ˚C lower than those of the other formulations. Onset temperatures for all mixtures in the second round of testing ranged from 42 ˚C to 64 ˚C, with an average of 54 ˚C.

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Contents of Appendices

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Date: 3/21/16 Operator: Hongshuo Tian

SFWB8-15%SWheat-1%Pb					
Bar Code	Lot #	Material	Theoretical Percentage (%)	Theoretical Weight (g)	Actual Weight (g)
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	3.69%	1.106	1.1053
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	14.66%	4.399	4.3977
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.18%	0.054	0.0550
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	5.60%	1.68	1.6801
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	41.14%	12.344	12.3433
1338361	144821	$NaNO_3$	9.12%	2.737	2.7376
1338408	143996	$Pb(NO_3)_2$	0.79%	0.236	0.2360
1338411	143866	$(COOH)_2 \cdot 2H_2O$	3.33%	0.999	0.9984
1339403	145088	K_2CO_3	1.68%	0.505	0.5048
NA	NA	Swheat	15.00%	4.5	4.4997
1338164	145280	Water	4.81%	1.443	1.4440
		Total	100.00%	30.003	30.0019

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time:
61 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time:
60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time:
60 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time:
62 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 3/21/16 Operator: Hongzhao Tian

SFWB8-15%SWheat-2%Pb					
Bar Code	Lot #	Material	Theoretical Percentage (%)	Theoretical Weight (g)	Actual Weight (g)
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	3.65%	1.2075	1.2072
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	14.51%	4.8015	4.8020
1337445	FOAY024	$Cr(NO_3)_3 \cdot 9H_2O$	0.18%	0.0585	0.0589
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	5.54%	1.8345	1.8348
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	40.73%	13.4775	13.4772
1338361	144821	$NaNO_3$	9.03%	2.988	2.9875
1338408	143996	$Pb(NO_3)_2$	1.57%	0.519	0.5193
1338411	143866	$(COOH)_2 \cdot 2H_2O$	3.30%	1.0905	1.0906
1339403	145088	K_2CO_3	1.68%	0.5565	0.5560
NA	NA	Swheat	15.00%	4.963	4.9639
1338164	145280	Water	4.81%	1.5915	1.5920
		Total	100.00%	33.088	33.0894

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 62 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 61 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 63 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 63 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 °C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/5/16 Operator: Hongzhao Tian

SFWB8-25%SWheat-1%Pb					
Bar Code	**Lot #**	**Material**	**Theoretical Percentage (%)**	**Theoretical Weight (g)**	**Actual Weight (g)**
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	3.25%	0.9755	0.9756
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	12.94%	3.881	3.8808
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.16%	0.0475	0.0477
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	4.94%	1.4825	1.4822
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	36.31%	10.8915	10.8914
1338361	144821	$NaNO_3$	8.05%	2.4145	2.4140
1338408	143996	$Pb(NO_3)_2$	0.69%	0.208	0.2076
1338411	143866	$(COOH)_2 \cdot 2H_2O$	2.94%	0.881	0.8810
1339403	145088	K_2CO_3	1.49%	0.4455	0.4457
NA	NA	Swheat	25.00%	7.5	7.4997
1338164	145280	Water	4.24%	1.273	1.2740
		Total	100.00%	30	29.9997

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 61 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 61 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 61 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/6/16 Operator: Hongzhao Tian

SFWB8-15%SWheat-4%Pb					
Bar Code	Lot #	Material	Theoretical Percentage (%)	Theoretical Weight (g)	Actual Weight (g)
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	3.58%	1.073	1.0727
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	14.22%	4.265	4.2657
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.18%	0.053	0.0533
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	5.43%	1.629	1.6287
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	39.90%	11.97	11.9703
1338361	144821	$NaNO_3$	8.85%	2.654	2.6540
1338408	143996	$Pb(NO_3)_2$	3.14%	0.942	0.9415
1338411	143866	$(COOH)_2 \cdot 2H_2O$	3.23%	0.968	0.9681
1339403	145088	K_2CO_3	1.68%	0.505	0.5046
NA	NA	Swheat	15.00%	4.5	4.4998
1338164	145280	Water	4.81%	1.443	1.4440
		Total	100.01%	30	30.0027

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 60 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 61 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 60 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 60 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/11/16 Operator: Hongzhao Tian

SFWB8-25%SWheat-2%Pb					
Bar Code	**Lot #**	**Material**	**Theoretical Percentage (%)**	**Theoretical Weight (g)**	**Actual Weight (g)**
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	3.22%	1.2075	1.2076
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	12.80%	4.8015	4.8016
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.16%	0.0585	0.0580
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	4.89%	1.8345	1.8346
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	35.94%	13.4775	13.4780
1338361	144821	$NaNO_3$	7.97%	2.988	2.9878
1338408	143996	$Pb(NO_3)_2$	1.38%	0.519	0.5195
1338411	143866	$(COOH)_2 \cdot 2H_2O$	2.91%	1.0905	1.0908
1339403	145088	K_2CO_3	1.48%	0.5565	0.5570
NA	NA	Swheat	25.00%	9.375	9.3742
1338164	145280	Water	4.24%	1.5915	1.5920
		Total	100.00%	37.5	37.5011

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 62 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 60 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 61 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/11/16 Operator: Hongzhao Tian

SFWB8-25%SWheat-4%Pb					
Bar Code	**Lot #**	**Material**	**Theoretical Percentage (%)**	**Theoretical Weight (g)**	**Actual Weight (g)**
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	3.16%	1.073	1.0725
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	12.54%	4.265	4.2659
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.16%	0.053	0.0533
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	4.79%	1.629	1.6295
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	35.20%	11.97	11.9697
1338361	144821	$NaNO_3$	7.81%	2.654	2.6545
1338408	143996	$Pb(NO_3)_2$	2.77%	0.942	0.9420
1338411	143866	$(COOH)_2 \cdot 2H_2O$	2.85%	0.968	0.9679
1339403	145088	K_2CO_3	1.49%	0.505	0.5059
NA	NA	Swheat	25.00%	8.5	8.4995
1338164	145280	Water	4.24%	1.443	1.4440
		Total	100.00%	34.002	34.0047

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 60sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 60 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 61 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/18/16 Operator: Hongzhao Tian

SFWB8-35%SWheat-1%Pb					
Bar Code	Lot #	Material	Theoretical Percentage (%)	Theoretical Weight (g)	Actual Weight (g)
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	2.82%	0.737	0.7376
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	11.21%	2.932	2.9325
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.14%	0.036	0.0365
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	4.28%	1.12	1.1207
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	31.46%	8.229	8.2301
1338361	144821	$NaNO_3$	6.97%	1.824	1.8234
1338408	143996	$Pb(NO_3)_2$	0.60%	0.157	0.1573
1338411	143866	$(COOH)_2 \cdot 2H_2O$	2.55%	0.666	0.6657
1339403	145088	K_2CO_3	1.29%	0.337	0.3371
NA	NA	Swheat	35.00%	9.154	9.1535
1338164	145280	Water	3.68%	0.962	0.962
		Total	100.00%	26.154	26.1564

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 60 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 62 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 60 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/18/16 Operator: Hongzhao Tian

SFWB8-35%SWheat-2%Pb					
Bar Code	Lot #	Material	Theoretical Percentage (%)	Theoretical Weight (g)	Actual Weight (g)
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	2.79%	0.846	0.8459
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	11.11%	3.364	3.3650
1337445	F094024	$Cr(NO_3)_3 \cdot 9H_2O$	0.14%	0.042	0.0426
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	4.24%	1.285	1.2859
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	31.17%	9.44	9.4402
1338361	144821	$NaNO_3$	6.91%	2.093	2.0928
1338408	143996	$Pb(NO_3)_2$	1.19%	0.36	0.3610
1338411	143866	$(COOH)_2 \cdot 2H_2O$	2.52%	0.764	0.7641
1339403	145088	K_2CO_3	1.27%	0.386	0.3859
NA	NA	Swheat	35.00%	10.599	10.5993
1338164	145280	Water	3.65%	1.104	1.104
		Total	100.00%	30.283	30.2867

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 62 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 60 sec

4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 62 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

Date: 4/25/16 Operator: Hongzhou Tian

SFWB8-35%SWheat-4%Pb					
Bar Code	**Lot #**	**Material**	**Theoretical Percentage (%)**	**Theoretical Weight (g)**	**Actual Weight (g)**
1338365	142299	$Al(NO_3)_3 \cdot 9H_2O$	2.73%	1.073	1.0730
1338372	144946	$Ca(NO_3)_2 \cdot 4H_2O$	10.87%	4.265	4.2656
1337445	F04Y024	$Cr(NO_3)_3 \cdot 9H_2O$	0.14%	0.053	0.0526
1338089	A0355097	$Fe(NO_3)_3 \cdot 9H_2O$	4.15%	1.629	1.6295
1338420	147856	$Mg(NO_3)_2 \cdot 6H_2O$	30.51%	11.97	11.9711
1338361	144821	$NaNO_3$	6.76%	2.654	2.6548
1338408	143996	$Pb(NO_3)_2$	2.40%	0.942	0.9420
1338411	143866	$(COOH)_2 \cdot 2H_2O$	2.47%	0.968	0.9683
1339403	145088	K_2CO_3	1.29%	0.505	0.5050
NA	NA	Swheat	35.00%	13.731	13.7308
1338164	145280	Water	3.68%	1.443	1.4440
		Total	100.00%	39.233	39.2367

4.2.1 The masses of nitrate salt components are measured in a plastic or aluminum weigh-boat or on waxed-paper using the calibrated balance #:
4.2.2 The weighed portion of nitrate salt will be transferred to a ceramic mortar.
4.2.3 The salts will be ground together using a pestle for about one minute.
Time: 60 sec

4.2.4 The mass of Swheat Scoop cat litter is measured
4.2.5 The weighed portion of Swheat Scoop cat litter will be transferred to a second ceramic mortar.
4.2.6 Swheat Scoop will be ground in the mortar using a pestle for about one minute.
Time: 60 sec

4.2.7 The mass of potassium carbonate and oxalic acid will be measured .
4.2.8 Water is measured into a glass beaker.
4.2.9 The oxalic acid and carbonate are added to the water and mixed.

4.2.10 The oxalate mixture is added to the nitrate salt sand they are mixed.
Time: 61 sec
4.2.11 The Swheat Scoop cat litter will be added to the wetted nitrate salt mixture and the resulting formulation mixed for approximately 1 minute, or until homogenous, using a spatula.
Time: 60 sec

4.2.12 The mixture of wetted nitrate salt and Swheat Scoop cat litter is transferred to a closeable disposable container or containers such as a 4 dram scintillation vial.
4.2.13 Samples will be labeled with their designated name, the date and time of preparation, and all appropriate hazard labels.

4.2.14 The glass container is heated using a hotplate with a surface temperature of approximately 60 ˚C for 4 hours.
Temp: 60°C

4.2.15 The cap is removed and the material is allowed to stand overnight at room temperature in a ventilation hood.

4.2.16 The material is submitted for testing.

B-1

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

SQM-PLAN- *To be completed by the Document Control Team.*	Rev.	Effective Date:

1. SOFTWARE INFORMATION

☐ New Software ☒ Existing Software

Complete a Form 2033, *Safety/Non-Safety Software Determination Categorization,* unless software is commercially controlled (non-safety) software. Examples of commercially controlled software that do not meet the reasonable probability criteria are personal productivity software such as MS PowerPoint, MS Outlook, Internet Explorer, and Mozilla Firefox.

Software Category:
- ☒ Non-Safety - Commercially Controlled
- ☐ Risk Significant: SRL # ☐ 1 ☐ 2 ☐ 3
- ☐ Safety: ☐ SSS ☐ SHADS ☐ SMACS
- ☐ Firmware
- ☒ Simple/Easily Understood
- ☐ Weapons

Software Name: Q Advantage / Thermal Advantage

Acronym: none — Software Version: 5.5.3

Software Type: ☒ COTS/Acquired ☐ Custom ☐ Other:

Software Description: Controls Differential Scanning Calorimeter

Software Owner: Mary Sandstrom — Z#: 138389 — Organization: M-7

Software Custodian: Mary Sandstrom — Z#: 138389 — Organization: M-7

Software Vendor: TA Instruments

Procurement Information ☒ N/A

PR#: — Number of Licenses: — Requestor:

PR Date: — Price: $ — Date of Receipt:

Charge Codes:

2. SOFTWARE EVALUATION*

Determinations based on risk associated with the software or impact of the software failure.

SQMP Type Required:
- ☐ Full (skip Section 3) – Required for Safety Software/Optional for Non-Safety
- ☒ FORM-JDIV-1005 (Section 3 of this form)

Baseline version exists: ☒ No ☐ Yes: Version #: 1.0

If existing software, is a Baseline Required?: ☒ No ☐ Yes Version #:

3. SOFTWARE QUALITY MANAGEMENT PLAN*

Determinations based on risk associated with the software or impact of the software failure.

Change Control:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:
Problem Reporting and Corrective Action:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

Interface Control:	☒ N/A ☐ Describe:
Other:	N/A

TRAINING REQUIREMENTS:

a. User: ☒ None ☐ OJT #: ☐ Other:

Users:			
	N/A		
	Name	*Z#*	*Organization*

b. Owner/Custodian: ☒ None ☐ OJT #: ☐ Other:

4. APPROVALS

When approved, submit completed form and associated documentation to the SQA POC for retention as a Controlled Document/Record.

Software Owner:	Mary M. Sandstrom	138389	M-7	Mary M Sandstrom	9/30/15
	Name	*Z#*	*Organization*	*Signature*	*Date*
SE *(if app.)*:	N/A				
	Name	*Z#*	*Organization*	*Signature*	*Date*
RLM	SHELDON A. LARSON	121882	M-7	Sheldon A. Larson	10/2/15
	Name	*Z#*	*Organization*	*Signature*	*Date*

Attach completed Form 2033, *Safety/Non-Safety Software Determination Categorization,* if completed.

Attach as applicable:

- Baseline Documents
- Procurement Package
- Traceability Matrix
- Requirements Identification and Documentation
- Design Documents
- Statement Of Work
- Installation Verification and Validation

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

SQM-PLAN- *To be completed by the Document Control Team.*	Rev.	Effective Date:

1. SOFTWARE INFORMATION

☐ New Software ☒ Existing Software

Complete a Form 2033, *Safety/Non-Safety Software Determination Categorization,* unless software is commercially controlled (non-safety) software. Examples of commercially controlled software that do not meet the reasonable probability criteria are personal productivity software such as MS PowerPoint, MS Outlook, Internet Explorer, and Mozilla Firefox.

Software Category:
- ☒ Non-Safety - Commercially Controlled
- ☐ Risk Significant: SRL # ☐ 1 ☐ 2 ☐ 3
- ☐ Safety: ☐ SSS ☐ SHADS ☐ SMACS
- ☐ Firmware
- ☒ Simple/Easily Understood
- ☐ Weapons

Software Name: Universal Analysis 2000

Acronym: none — Software Version: 4.5A Build 54.5.0.5

Software Type: ☒ COTS/Acquired ☐ Custom ☐ Other:

Software Description: Analyzes data from the Differential Scanning Calorimeter

Software Owner: Mary Sandstrom — Z#: 138389 — Organization: M-7

Software Custodian: Mary Sandstrom — Z#: 138389 — Organization: M-7

Software Vendor: TA Instruments

Procurement Information ☒ N/A

PR#: — Number of Licenses: — Requestor:

PR Date: — Price: $ — Date of Receipt:

Charge Codes:

2. SOFTWARE EVALUATION*

Determinations based on risk associated with the software or impact of the software failure.

SQMP Type Required:
- ☐ Full (skip Section 3) – Required for Safety Software/Optional for Non-Safety
- ☒ FORM-JDIV-1005 (Section 3 of this form)

Baseline version exists: ☒ No ☐ Yes: Version #: 1.0

If existing software, is a Baseline Required?: ☒ No ☐ Yes Version #:

3. SOFTWARE QUALITY MANAGEMENT PLAN*

Determinations based on risk associated with the software or impact of the software failure.

Change Control:
- ☒ N/A
- ☐ FORM-JDIV-1004, *Software Problem Report/Change Request*
- ☐ Other:

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

Problem Reporting and Corrective Action:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:
Interface Control:	☒ N/A ☐ Describe:
Other:	N/A

TRAINING REQUIREMENTS:

a. User: ☒ None ☐ OJT #: ☐ Other:

Users:			
	N/A		
	Name	*Z#*	*Organization*

b. Owner/Custodian: ☒ None ☐ OJT #: ☐ Other:

4. APPROVALS

When approved, submit completed form and associated documentation to the SQA POC for retention as a Controlled Document/Record.

Software Owner: Mary M. Sandstrom	138389	M-7	Mary M Sandstrom	9/30/15
Name	*Z#*	*Organization*	*Signature*	*Date*
SE *(if app.)*: N/A				
Name	*Z#*	*Organization*	*Signature*	*Date*
RLM SHELDON A. LARSON	121882	M-7	Sheldon A. Larson	10/2/15
Name	*Z#*	*Organization*	*Signature*	*Date*

Attach completed Form 2033, *Safety/Non-Safety Software Determination Categorization*, if completed.

Attach as applicable:

- Baseline Documents
- Procurement Package
- Traceability Matrix
- Requirements Identification and Documentation
- Design Documents
- Statement Of Work
- Installation Verification and Validation

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

SQM-PLAN- *To be completed by the Document Control Team.*	Rev.	Effective Date:

1. SOFTWARE INFORMATION

☐ New Software ☒ Existing Software

Complete a Form 2033, *Safety/Non-Safety Software Determination Categorization,* unless software is commercially controlled (non-safety) software. Examples of commercially controlled software that do not meet the reasonable probability criteria are personal productivity software such as MS PowerPoint, MS Outlook, Internet Explorer, and Mozilla Firefox.

Software Category:
- ☒ Non-Safety - Commercially Controlled
- ☐ Risk Significant: SRL # ☐ 1 ☐ 2 ☐ 3
- ☐ Safety: ☐ SSS ☐ SHADS ☐ SMACS
- ☐ Firmware
- ☒ Simple/Easily Understood
- ☐ Weapons

Software Name: APTAC

Acronym: none — Software Version: 1.5.36 RPV9

Software Type: ☒ COTS/Acquired ☐ Custom ☐ Other:

Software Description: Controls the APTAC instrument.

Software Owner: Ernie Hartline — Z#: 188218 — Organization: M-7

Software Custodian: Ernie Hartline — Z#: 188218 — Organization: M-7

Software Vendor: TIAX Inc.

Procurement Information ☒ N/A

PR#: — Number of Licenses: — Requestor:

PR Date: — Price: $ — Date of Receipt:

Charge Codes:

2. SOFTWARE EVALUATION*

Determinations based on risk associated with the software or impact of the software failure.

SQMP Type Required:
- ☐ Full (skip Section 3) – Required for Safety Software/Optional for Non-Safety
- ☒ FORM-JDIV-1005 (Section 3 of this form)

Baseline version exists: ☒ No ☐ Yes: Version #: 1.0

If existing software, is a Baseline Required?: ☒ No ☐ Yes Version #:

3. SOFTWARE QUALITY MANAGEMENT PLAN*

Determinations based on risk associated with the software or impact of the software failure.

Change Control:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:
Problem Reporting and Corrective Action:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

Interface Control:	☒ N/A ☐ Describe:
Other:	N/A

TRAINING REQUIREMENTS:

a. User: ☒ None ☐ OJT #: ☐ Other:

Users:			
	N/A		
	Name	*Z#*	*Organization*

b. Owner/Custodian: ☒ None ☐ OJT #: ☐ Other:

4. APPROVALS

When approved, submit completed form and associated documentation to the SQA POC for retention as a Controlled Document/Record.

Software Owner: Ernest Hartline	188218	M-7		10/1/15
Name	*Z#*	*Organization*	*Signature*	*Date*
SE *(if app.)*: N/A				
Name	*Z#*	*Organization*	*Signature*	*Date*
RLM SHELDON A. LARSON	121882	M-7		10/2/15
Name	*Z#*	*Organization*	*Signature*	*Date*

Attach completed Form 2033, *Safety/Non-Safety Software Determination Categorization,* if completed.

Attach as applicable:

- Baseline Documents
- Procurement Package
- Traceability Matrix
- Requirements Identification and Documentation
- Design Documents
- Statement Of Work
- Installation Verification and Validation

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

SQM-PLAN-M7-5009 *To be completed by the Document Control Team.*	Rev. B	Effective Date:

1. SOFTWARE INFORMATION

☐ New Software ☒ Existing Software

Complete a Form 2033, *Safety/Non-Safety Software Determination Categorization,* unless software is commercially controlled (non-safety) software. Examples of commercially controlled software that do not meet the reasonable probability criteria are personal productivity software such as MS PowerPoint, MS Outlook, Internet Explorer, and Mozilla Firefox.

Software Category:
- ☒ Non-Safety - Commercially Controlled
- ☐ Risk Significant: SRL # ☐ 1 ☐ 2 ☐ 3
- ☐ Safety: ☐ SSS ☐ SHADS ☐ SMACS
- ☐ Firmware
- ☒ Simple/Easily Understood
- ☐ Weapons

Software Name: Proteus Thermal Analysis

Acronym: N/A — Software Version: 7.0.1 (01.10.2015)

Software Type: ☒ COTS/Acquired ☐ Custom ☐ Other:

Software Description: Analysis data from APTAC instrument.

Software Owner: Geoff Brown — Z#: 118813 — Organization: M-7

Software Custodian: Geoff Brown — Z#: — Organization: M-7

Software Vendor: NETZSCH

Procurement Information ☒ N/A

PR#: — Number of Licenses: — Requestor:

PR Date: — Price: $ — Date of Receipt:

Charge Codes:

2. SOFTWARE EVALUATION*

Determinations based on risk associated with the software or impact of the software failure.

SQMP Type Required:
- ☐ Full (skip Section 3) – Required for Safety Software/Optional for Non-Safety
- ☒ FORM-JDIV-1005 (Section 3 of this form)

Baseline version exists: ☒ No ☐ Yes: Version #:

If existing software, is a Baseline Required?: ☒ No ☐ Yes Version #:

3. SOFTWARE QUALITY MANAGEMENT PLAN*

Determinations based on risk associated with the software or impact of the software failure.

Change Control:	☐ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☒ Other: Track revisions in Division Inventory
Problem Reporting and Corrective Action:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

Interface Control:	☒ N/A ☐ Describe:
Other:	

TRAINING REQUIREMENTS:

a. User: ☒ None ☐ OJT #: ☐ Other:

Users:			
	Name	*Z#*	*Organization*

b. Owner/Custodian: ☒ None ☐ OJT #: ☐ Other:

4. APPROVALS

When approved, submit completed form and associated documentation to the SQA POC for retention as a Controlled Document/Record.

Software Owner:	Geoff Brown	118813	M-7	Geoff W. Brown	12/18/15
	Name	*Z#*	*Organization*	*Signature*	*Date*
SE *(if app.)*:	N/A				
	Name	*Z#*	*Organization*	*Signature*	*Date*
RLM	K. Levinta	114740	M-7	K Levinta	12/18/15
	Name	*Z#*	*Organization*	*Signature*	*Date*

Attach completed Form 2033, *Safety/Non-Safety Software Determination Categorization*, if completed.

Attach as applicable:

- Baseline Documents
- Procurement Package
- Traceability Matrix
- Requirements Identification and Documentation
- Design Documents
- Statement Of Work
- Installation Verification and Validation

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

SQM-PLAN- *To be completed by the Document Control Team.*	Rev.	Effective Date:

1. SOFTWARE INFORMATION

☐ New Software ☒ Existing Software

Complete a Form 2033, *Safety/Non-Safety Software Determination Categorization,* unless software is commercially controlled (non-safety) software. Examples of commercially controlled software that do not meet the reasonable probability criteria are personal productivity software such as MS PowerPoint, MS Outlook, Internet Explorer, and Mozilla Firefox.

Software Category:
- ☒ Non-Safety - Commercially Controlled
- ☐ Risk Significant: SRL # ☐ 1 ☐ 2 ☐ 3
- ☐ Safety: ☐ SSS ☐ SHADS ☐ SMACS
- ☐ Firmware
- ☒ Simple/Easily Understood
- ☐ Weapons

Software Name: Winstab

Acronym: none — Software Version: 3.22 (3.22.2006.1021)

Software Type: ☒ COTS/Acquired ☐ Custom ☐ Other:

Software Description: Controls the Vacuum Thermal Stability instrument

Software Owner: Jose Archuleta — Z#: 079834 — Organization: M-7

Software Custodian: Jose Archuleta — Z#: 079834 — Organization: M-7

Software Vendor: OZM Research

Procurement Information ☒ N/A

PR#: — Number of Licenses: — Requestor:

PR Date: — Price: $ — Date of Receipt:

Charge Codes:

2. SOFTWARE EVALUATION*

Determinations based on risk associated with the software or impact of the software failure.

SQMP Type Required:
- ☐ Full (skip Section 3) – Required for Safety Software/Optional for Non-Safety
- ☒ FORM-JDIV-1005 (Section 3 of this form)

Baseline version exists: ☒ No ☐ Yes: Version #: 1.0

If existing software, is a Baseline Required?: ☒ No ☐ Yes Version #:

3. SOFTWARE QUALITY MANAGEMENT PLAN*

Determinations based on risk associated with the software or impact of the software failure.

Change Control:
- ☒ N/A
- ☐ FORM-JDIV-1004, *Software Problem Report/Change Request*
- ☐ Other:

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

Problem Reporting and Corrective Action:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:
Interface Control:	☒ N/A ☐ Describe:
Other:	N/A

TRAINING REQUIREMENTS:

a. User: ☒ None ☐ OJT #: ☐ Other:

Users:			
	N/A		
	Name	*Z#*	*Organization*

b. Owner/Custodian: ☒ None ☐ OJT #: ☐ Other:

4. APPROVALS

When approved, submit completed form and associated documentation to the SQA POC for retention as a Controlled Document/Record.

Software Owner: Jose G. Archuleta	07834	M-7	Jose G. Archuleta	9/30/15
Name	*Z#*	*Organization*	*Signature*	*Date*
SE *(if app.)*: N/A				
Name	*Z#*	*Organization*	*Signature*	*Date*
RLM SHELDON A. LARSON	121882	M-7	Sheldon A. Larson	10/2/15
Name	*Z#*	*Organization*	*Signature*	*Date*

Attach completed Form 2033, *Safety/Non-Safety Software Determination Categorization,* if completed.

Attach as applicable:

- Baseline Documents
- Procurement Package
- Traceability Matrix
- Requirements Identification and Documentation
- Design Documents
- Statement Of Work
- Installation Verification and Validation

** Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

SQM-PLAN- *To be completed by the Document Control Team.*	Rev.	Effective Date:

1. SOFTWARE INFORMATION

☐ New Software ☒ Existing Software

Complete a Form 2033, *Safety/Non-Safety Software Determination Categorization,* unless software is commercially controlled (non-safety) software. Examples of commercially controlled software that do not meet the reasonable probability criteria are personal productivity software such as MS PowerPoint, MS Outlook, Internet Explorer, and Mozilla Firefox.

Software Category:
- ☒ Non-Safety - Commercially Controlled
- ☐ Risk Significant: SRL # ☐ 1 ☐ 2 ☐ 3
- ☐ Safety: ☐ SSS ☐ SHADS ☐ SMACS
- ☐ Firmware
- ☒ Simple/Easily Understood
- ☐ Weapons

Software Name: SenTest

Acronym: none — Software Version: 1.0

Software Type: ☒ COTS/Acquired ☐ Custom ☐ Other:

Software Description: Statistical analysis software used in sensitivity testing.

Software Owner: Hongzhao Tian — Z#: 230045 — Organization: M-7

Software Custodian: Hongzhao Tian — Z#: 230045 — Organization: M-7

Software Vendor: Neyer

Procurement Information ☒ N/A

PR#: — Number of Licenses: — Requestor:

PR Date: — Price: $ — Date of Receipt:

Charge Codes:

2. SOFTWARE EVALUATION*

Determinations based on risk associated with the software or impact of the software failure.

SQMP Type Required:
- ☐ Full (skip Section 3) – Required for Safety Software/Optional for Non-Safety
- ☒ FORM-JDIV-1005 (Section 3 of this form)

Baseline version exists: ☒ No ☐ Yes: Version #: 1.0

If existing software, is a Baseline Required?: ☒ No ☐ Yes Version #:

3. SOFTWARE QUALITY MANAGEMENT PLAN*

Determinations based on risk associated with the software or impact of the software failure.

Change Control:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:
Problem Reporting and Corrective Action:	☒ N/A ☐ FORM-JDIV-1004, *Software Problem Report/Change Request* ☐ Other:

* *Form guidance for this section is attached to the form.*

SOFTWARE EVALUATION/QUALITY MANAGEMENT PLAN (QMP)

Interface Control:	☒ N/A ☐ Describe:
Other:	N/A

TRAINING REQUIREMENTS:

a. User: ☒ None ☐ OJT #: ☐ Other:

Users:			
	N/A		
	Name	*Z#*	*Organization*

b. Owner/Custodian: ☒ None ☐ OJT #: ☐ Other:

4. APPROVALS

When approved, submit completed form and associated documentation to the SQA POC for retention as a Controlled Document/Record.

Software Owner:	Hongzhao Tian	230045	M-7	Hongzhao Tian	10/1/15
	Name	*Z#*	*Organization*	*Signature*	*Date*
SE *(if app.)*:	N/A				
	Name	*Z#*	*Organization*	*Signature*	*Date*
RLM	SHELDON A. LARSON	121582	M-7	Sheldon A. Larson	10/2/15
	Name	*Z#*	*Organization*	*Signature*	*Date*

Attach completed Form 2033, *Safety/Non-Safety Software Determination Categorization,* if completed.

Attach as applicable:

- Baseline Documents
- Procurement Package
- Traceability Matrix
- Requirements Identification and Documentation
- Design Documents
- Statement Of Work
- Installation Verification and Validation

** Form guidance for this section is attached to the form.*

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BOOK PAGE

TITLE PROJECT WIPP

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3/16/16 20% DTBP in Toluene

DTBP Barcode: 1352757
Toluene Barcode: 1352363

Vessel wt: 53.85g

7g DTBP + 28g Toluene = 35g

HWS
START: 95C
LIMIT: 265C
increment: 5C
Cooldown: 50C
ExoTherm Threshold: 0.04
ExoTherm Limit: 250C
heat Rate: 2C
Level: 270C
min pressure: 101.5 psi

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SIGNATURE

DATE 3/17/16

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DATE

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JOK PAGE

TITLE PROJECT WIPP

Continued from page

APTAC: Temperature + Pressure verification
APTAC model: APTAC 264
Serial number: 002L0715-606002447

Omega handheld RTD Thermometer - calibrated 7/27/15
model: 869C
Serial #: T-308219

Using calibrated RTD, Vessel Thermocouple & metered RTD connected To copper Block, WRAPPED with heat Tape strip, controlled with Variac.

Using calibrated omega pressure gauge: FILE: 104079

Temperature		Pressure	
RTD(°C)	APTAC(°C)	Gauge (psi	APTAC psi (Vessel)
29.8	30	25	25
39.7	40	50	50
49.3	50	75	75
59.2	60	100	100
68.9	70	151	150
78.8	80	202	200
88.8	90	252	250
99.1	100	303	300
109.4	110	353	350
119.5	120	403	400
129.6	130	453	450
140	140	502	500
149.9	150		
159.8	160		

Reassembled + leak checked to 500 psi.

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SIGNATURE [signature] DATE 3/18/16

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BOOK PAGE

TITLE **PROJECT** WIPP

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3/22/16
APTAC model: APTAC 264
Serial #: 002 L0715-60600247

Sample Vessel weight: 41.7269 g (10 mL Titanium sample vessel)
Weight Taken on mettler Toledo Scale TFG#02049, File#040858
model: XP504

WIPP Sample: SFWB8-15-1 Run3 Lims. 160324013 Lab 52279
Weight Taken on mettler Toledo scale TFG#02049, File#040858
model: XP504

Sample weight: 4.0028 g
glass wool on Top: 0.0970 g

START Temp: 30C — Exotherm Threshold: 0.05 C
Limit Temp: 250 C — Exotherm Limit: 400 C
Temp increment: 2C — Heat Rate: 2C/min
Cool Down Temp: 50C — min. Pressure: 0 PSI
mode: HWS

File Name: SFWB8-15-1 RUN 3 3-22-16

Comments: Plugging built to Transducer. pressure still shows 121 psi
Plugging Removed. Residue left in vessel still seems somewhat
wet compared to others. System flushed + left to Dry.

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SIGNATURE [signature] DATE 3/23/16

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TITLE PROJECT WIPP

Continued from page

3/24/16
APTAC model: APTAC 264
Serial #: 002L0715-60600244 7

Sample Vessel weight: 41.7133 g (10 mL Titanium sample vessel)
Weight Taken on mettler ToLedo scale TFG# 02049, File# 040858
model: XP504

WIPP Sample: SFWB8-15-2 RUN 3 Lims 160324014 Lab# 52279
Weight Taken on mettler ToLedo scale TFG# 02049, File# 040858
model: XP504

Sample weight: 4.0006 g
glass wool on Top: 0.0909 g

START Temp: 30 C
Limit Temp: 250 C
Temp increment: 2 C
Cool Down Temp: 50 C
mode: HWS

Exotherm Threshold: 0.05 C
Exotherm Limit: 400 C
Heat. Rate: 2C/min.
min Pressure. 0 psi

File name: Lab52279 SFWB8-15-2 RUN 3 3-24-16

Comments: Light Plugging flushed system & left open to Dry, for several hours. Reassembled & pressure checked for next Run.

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SIGNATURE DATE 3/25/16

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BOOK PAGE

TITLE **PROJECT** WIPP

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4/7/16
APTAC model: APTAC 264
Serial #: 002L0715-6060 02447

Sample Vessel empty weight: 41.7078 g (10 mL TITANIUM Sample Vessel)
Weight Taken on METTLER TOLEDO SCALE TFG#02049, file#040858
model: XP504

WIPP Sample: SFWB8-15-4 RUN 3 Lims#160407002 Lab: 52279
Weight Taken on METTLER TOLEDO SCALE TFG#02049, file#040858
model: XP504

Sample weight: 4.0006 g
GLASS WOOL on Top: 0.0960 g

START Temp: 30C
Limit Temp: 250C
Temp Increment: 2C
Cool Down Temp: 50C
mode: HWS

Exotherm Threshold: 0.05C
Exotherm Limit: 400C
Heat Rate: 2C/min.
min. Pressure: 0PSI

File name: Lab52279SFWB8-15-4 RUN 3 4-7-16

Comments: NO major plugging some slightly toward pressure Transducer. System Rinsed & Drying. Residue from sample vessel seems wet.

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SIGNATURE

DATE 4/8/16

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TITLE PROJECT WIPP

Continued from page

4/6/16
APTAC model: APTAC 264
serial #: 0021 0715-606002447

Sample Vessel empty weight: 41.7147 g (10mL Titanium sample vessel)
weight Taken on mettler Toledo scale TFG#02049, File# 040858
model: XP504

WIPP Sample: SFWB8-25-1 RUN 3
weight Taken on mettler Toledo scale TFG#02049, file#040858
model: XP504

Sample Weight: 4.0037 g
glass wool on top: 0.0941 g

Start Temp: 30C
Limit Temp: 250C
Temp Increment: 2C
Cool Down Temp: 50C
mode: HWS

Exotherm Threshold: 0.05C
Exotherm Limit: 400C
Heat Rate: 2C/min
min Pressure: 0psi

File Name: SFWB8-25-1 RUN 3 4-6-16

Comments: Residue in vessel after Run wetter than usual. Some plugging. System flushed + drying.

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SIGNATURE [signature] DATE 4/7/16

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BOOK PAGE

TITLE PROJECT WIPP

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3/29/16
APTAC model: APTAC 264
Serial #: 002L0715-606002447

Sample vessel Empty weight: 41.1174 g (10mL Titanium sample vessel)
Weight Taken on mettler Toledo scale TFG#02049, A.Le #040858
model: XP504

WIPP Sample: SWB8-25-2 zeolite Treated
Weight Taken on mettler Toledo scale TFG#02049, A.Le#040858
model: XP504

Sample Weight: 3.9940 g
Glass wool on Top: 0.0911 g

START Temp: 30 C — Exotherm Threshold: 0.05C
Limit Temp: 250 C — Exotherm Limit: 400 C
Temp Increment: 2 C — Heat Rate: 2C/min
Cool Down Temp: 50 C — Min pressure: 0 PSI
mode: HWS

file name: SWB8-25-2 Zeolite 3-29-16

Comments: Sample Looks like green pills during loading.

Very little if any plugging system still flushed. Left over natural Day + pondering.

Continued to page

SIGNATURE [signature] DATE 4/1/16

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TITLE PROJECT WiPP

Continued from page

4/14/16
APTAC model: APTAC 264
Serial number: 002L0715-60600244?

Sample vessel empty weight: 41.7150 g (10mL Titanium sample vessel)
Weight Taken on Mettler Toledo scale TFG#02049, File#040858
model: XP504

WIPP Sample: SFWB8-25-4 RUN3 Lims#1604201# Lab#52279
Weight Taken on mettler Toledo scale TFG#02049, File#040858
model: XP504

Sample weight: 4.0024 g
glass wool on top: 0.0967 g

START Temp: 30 C — Exotherm Threshold: 0.05 C
Limit Temp: 250 C — Exotherm Limit: 400 C
Temp Increment: 2C — Heat Rate: 2C/min
Cool Down Temp: 50 C — min pressure: 0psi
mode: HWS

File name: Lab52279 SFWB8-25-4 RUN3 4-14-16

Comments: slight plugging. Septum flushed.

Continued to page

SIGNATURE [signature] DATE 4/15/16

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TITLE PROJECT WIPP

Continued from page

4/19/16
APTAC model: APTAC 264
Serial #: 002L0715-606002447

Sample vessel empty weight: 41.7152 g (10 mL Ti Taniguin Stainless Vessel)
weight Taken on mettler Toledo scale TFG# 02049, F.L# 040858
model: XP504

WIPP sample: SFWB8-35-1 RUN3 Lims# Lab# 52279
weight Taken on mettler Toledo scale TFG# 02049, F.L# 040858
model: XP504

Sample weight: 4.0007 g
glass wool on Top: 0.0938 g

Start Temp: 30C — Exotherm Threshold: 0.05 C
Limit Temp: 250C — Exotherm Limit T: 400C
Temp increment: 2C — Heat Rate: 2C/min
Cool Down Temp: 50C — min Pressure: 0 psi.
mode: HWS

file name: Lab 52279 SFWB8-35-1 RUN3 4-19-16

comments: some plugging to Transducer, system flushed.

Continued to page

SIGNATURE

DATE 4/20/16

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DATE

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BOOK PAGE

TITLE **PROJECT** WIPP

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4/21/16
APTAC model: APTAC264
Serial #: 00210715-606002447

Sample vessel empty weight: 41.7170 g (10mL Titanium sample vessel)
Weight Taken on mettler Toledo scale TFG#02049, file#040858
model: XP504

WIPP Sample: SFWB8-35-2 RUN3 Lims# Lab# 52279
Weight Taken on mettler Toledo scale TFG#02049, file#040858
model: XP504

Sample Weight: 3.9999 g
glass wool on top: 0.0900 g

START Temp: 30C Exotherm Threshold: 0.05C
Limit Temp: 250C Exotherm Limit: 400C
Temp Increment: 2C Heat Rate: 2C/min
Cool Down: 50C min pressure: 0psi
mode: HWS

file name: Lab52279 SFWB8-35-2 Run3 4-21-16

Comments: system flushed

Continued to page

SIGNATURE [signature] DATE 4/22/16

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BOOK PAGE

TITLE **PROJECT**

Continued from page

4/26/16
APTAC model: APTAC 264
Serial # 002L0715-60600247

Sample Vessel empty weight: 41.7212 g (10mL Titanium sample vessel)
weight Taken on mettler Toledo scale TFG #02049, File # 040858
model: XP504

WIPP Sample: SFWB8-35-4 RUN3 LIMS # Lab # 52279
weight TAKEN on mettler Toledo scale TFG #02049, file # 040858
model: XP504

Sample weight: 4.000 g
glass wool on Top: 0.0942 g

START Temp: 30C
Limit Temp: 250C
Temp Increment: 2C
cool Down Temp: 50C
mode: HWS

ExoTherm Threshold: 0.05C
ExoTherm Limit: 400C
Heat RATE: 2C/min
min. Pressure: 0psi

File NAME: Lab52279.5FWB8-35-4 RUN3 4-26-16

Comment: some plugging to headspace, system flushed.

Continued to page

SIGNATURE

DATE 4/27/16

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BOOK PAGE

TITLE PROJECT WIPP

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4/28/16 20% DTBP in Toluene (verification)

DTBP Barcode: 1352757
Toluene Barcode: 1352363

Vessel wt: 53.85g

7g DTBP + 28g Toluene = 35g

HWS

START: 95C
Limit: 265C
increment: 5C
cooldown: 50C
ExoTherm Threshold: 0.04
ExoTherm Limit: 250C
Heat Rate: 2C
Level: 270C
min pressure: 101.5 psi

Continued to page

SIGNATURE [signature] DATE 4/29/16

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BOOK PAGE

TITLE **PROJECT** WIPP

Continued from page

4/29/16
Temperature + Pressure verification
APTAC model: APTAC 264
Serial Number: 002L0715-606002447

Omega handheld RTD Thermometer - calibrated 7/27/15
model: 869C
Serial #: T-308219

Vessel Thermometer + meter RTD connected to copper Block
Wrapped with heat Tape strip, controlled with variac.

Using calibrated omega pressure gauge: file: 104079

Temperature		Pressure	
RTD (°C)	APTAC (°C)	Gauge (psi)	APTAC (psi)
30.3	30	25	25
40.0	40	50	50
50.2	50	75	75
59.9	60	100	100
69.0	70	150	150
79.0	80	202	200
89.0	90	252	250
99.3	100	303	300
109.4	110	352	350
119.7	120	402	400
129.7	130	452	450
139.8	140	502	500
149.6	150		
159.3	160		

Reassembled + leak checked to 500 psi.

Continued to page

SIGNATURE [signature] DATE 4/29/16

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Los Alamos Research Laboratories

LOS ALAMOS NATIONAL LABORATORY

PTN #: 1673230 Chem log 09/03/2015 1352756 1352757

DROP PT: 09002901S RT: 4C

DELIVER TO: (118813)Brown, Geoffrey Wayne (

PHONE#: 505-667-6718

AC349932500 ACROS Organics N

McGregor Brown 9/4/15

VENDOR:

GOVERNMENT SCIENTIFIC SOURCE-P2650800

ORDER TYPE: STANDARD

ITEM#:

PART#: AC349932500

QTY: 2.0 Each STR LEV:

DESCRIPTION:

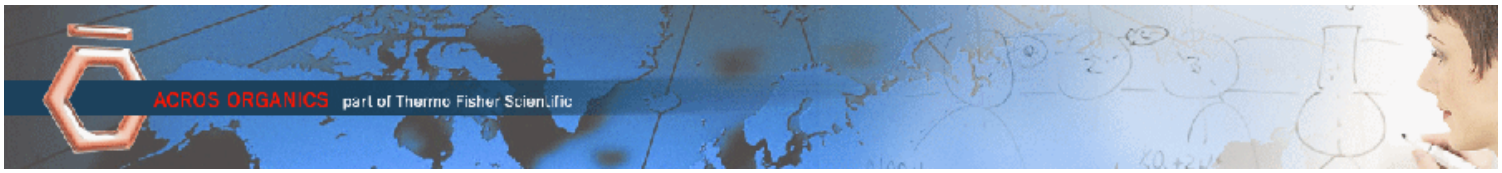
AC349932500 ACROS Organics No.:349932500

Di-tert-butyl peroxide99Application:Radical

PO#: 350508 , LN: 1, SHP: 1

Required: Chmlg QA ML4NOINSP

Lot A0339376



ACROS ORGANICS

Version	2
Molecular weight	146.23
Molecular formula	C8 H18 O2
CAS No	110-05-4
Linear formula	(CH3)3COOC(CH3)3
Flash point (°C)	6

Certificate of Analysis

This is to certify that units of the below mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Acros Organics expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for use in manufacturing, consumption or application of drugs, cosmetics, dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Catalog Number	34993	**Quality Test / Release Date**	9 April 2015
Lot Number	A0339376	**Suggested Retest Date**	April 2016

Description	Di-tert-butyl peroxide,99%
Country of Origin	NETHERLANDS
Declaration of Origin	synthetic

Origin Comment

Result Name	Specifications	Test Value
Appearance	clear liquid	clear liquid
Infrared spectrometry	Authentic	Authentic
GC	>=98.5 %	99.7 %
Refractive index	1.3880 to 1.3900 (20°C, 589 nm)	1.3889 (20°C, 589 nm)
GC	=<0.1 % Tert-butyl hydroperoxide	0.04 % Tert-butyl hydroperoxide

L. Van den Broek, QA Manager Issued: 4 September 2015

Acros Organics
ENA23, zone 1, nr 1350, Janssen Pharmaceuticalaan 3a, B-2440 Geel, Belgium
Tel +32 14/57.52.11 - Fax +32 14/59.34.34 Internet: http://www.acros.com
1 Reagent Lane, Fair Lawn, NJ 07410,USA Fax 201-796-1329

PACKING SLIP

Government Scientific Source, Inc.
12351 Sunrise Valley Drive, Reston, Virginia 20191
*(800) 248-8030 * (703) 734-1805*
Fax (703) 734-1803

Shipment Number: 1301021
Shipment Date: 08/26/15

Bill To:

DOE / LOS ALAMOS NATIONAL LAB
DO NOT DROP SHIP
O
eCommerce, GSS will create the
Shipping Notice, Net 30 Days
LOS ALAMOS, NM 87545
United States

Customer ID LOS ALAMOS
Our Order No. **S836479**
SalesPerson ROSALIE GOMEZ

Ship To:

LANL for US DOE/NNSA
BROWN, GEOFFREY
350508
Bikini Atoll Road
SM-30 Warehouse
Los Alamos, NM 87545
United States

Tracking No. 425142 CHEM
P.O. Number **350508**
P.O. Date 08/18/15
Ship Via GSS

Supplier	Item No.	Description	Unit	Shipped	Ordered	Back Ordered
FISHER SCI	AC349932500	Di-tert-butyl Peroxide 250gr	Each		2	2
FISHER SCI	T324500	Toluene Certified Acs 500ml	Each	2	2	

152579 — B/C 1352363
Lot 152579 — B/C 1352364

PMR 11813
6/27/15

Fisher Scientific

1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2008 standard by SAI Global Certificate Number CERT - 0064970

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Catalog Number	**T324**	**Quality Test / Release Date 4/9/2015**	
Lot Number	**152579**		
Description	**TOLUENE, A.C.S.**		
Country of Origin	**United States**	*** Suggested Retest Date**	**Apr-2020**
Chemical Origin	**Organic - non animal**		
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.		

Result name	Units	Specifications	Test Value
APPEARANCE		REPORT	CLEAR, COLORLESS LIQUID
ASSAY	%	>= 99.5	99.9
COLOR	APHA	<= 10	5
COPPER (Cu)	ppm	<= 0.1	<0.01
EVAPORATION RESIDUE	%	<= 0.001	<0.0001
HEAVY METALS (as Pb)	ppm	<= 0.1	<0.10
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
IRON (Fe)	ppm	<= 0.1	<0.01
NICKEL (Ni)	ppm	<= 0.1	<0.01
SUBSTANCES DARKENED BY H2SO4	PASS/FAIL	= PASS TEST	PASS TEST
SULFUR COMPOUNDS	%	<= 0.003	<0.0030
WATER (H2O)	%	<= 0.03	0.003

Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of this product, expressed as a extension of this catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701.
*Based on suggested storage condition.