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Thermophysical Properties of Reconsolidating Crushed Salt

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Abstract

Reconsolidated crushed salt is being considered as a backfilling material placed upon nuclear waste within a salt repository environment. In-depth knowledge of thermal and mechanical properties of the crushed salt as it reconsolidates is critical to thermal/mechanical modeling of the reconsolidation process. An experimental study was completed to quantitatively evaluate the thermal conductivity of reconsolidated crushed salt as a function of porosity and temperature.

The crushed salt for this study came from the Waste Isolation Pilot Plant (WIPP). In this work the thermal conductivity of crushed salt with porosity ranging from 1% to 40% was determined from room temperature up to 300°C, using two different experimental methods. Thermal properties (including thermal conductivity, thermal diffusivity and specific heat) of single-crystal salt were determined for the same temperature range. The salt was observed to dewater during heating; weight loss from the dewatering was quantified.

The thermal conductivity of reconsolidated crushed salt decreases with increasing porosity; conversely, thermal conductivity increases as the salt consolidates. The thermal conductivity of reconsolidated crushed salt for a given porosity decreases with increasing temperature.

A simple mixture theory model is presented to predict and compare to the data developed in this study.

ACKNOWLEDGMENTS

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1. INTRODUCTION

Reconsolidation of crushed salt is a very important physical phenomenon when backfilling or sealing nuclear waste repositories in salt. There is a long history of testing crushed salt backfill for salt repository applications. Determination of mechanical properties pertaining to salt reconsolidation has been a topic of great interest to international salt repository studies as exemplified at symposia (for example: Aubertin and Hardy, 1996 and Wallner et al., 2007). A preponderance of these studies have been at room temperature, with a few tests at elevated temperatures up to 100°C. Today there is a renewed national and international interest in salt reconsolidation at elevated temperature, particularly as applied to disposal of heat-generating nuclear waste. This report puts forward the experimental procedures and results of a laboratory study to determine the thermal conductivity of reconsolidated crushed salt, emphasizing testing as a function of porosity.

The primary purpose of these experiments is to quantitatively evaluate the thermal conductivity of consolidated crushed salt as a function of porosity. A secondary purpose is to observe the temperature dependence of thermal conductivity of porous crushed salt. The salt used in these experiments is "mine-run," which means the aggregate was produced during normal mining operations of the WIPP facility. The laboratory studies are intended to provide data representing thermal conductivity behavior as a function of porosity and temperature up to 300°C.

The thermal conductivity of both halite and rock salt have been the subject of historical study, and the presence of porosity, fractures, and impurities will each affect thermal conductivity (e.g., Birch and Clark, 1940a, b; Smith, 1976; Acton, 1979; Sweet and McCreight, 1979; Morgan, 1979; Robertson, 1988; Durham and Abbey, 1981a; Durham and Abbey, 1981b; Durham, et al, 1983a; Durham et al, 1983b; Liu, et al, 2011). This previous work provides important background to the present study and should be used to guide thermal modeling analyses of salt.

Considerable laboratory work has previously been done to determine the thermal conductivity of bedded and domal salt at a range of temperatures and pressures (e.g., Smith, 1976; Durham, et al., 1983; Durham, et al., 1984; Durham and Abey, 1981a; Durham and Abey, 1981b). The temperature regime of interest for these studies is generally from room temperature to as high as 650°C (~0.8T_m), most are in the range of room temperature to 300°C. Confining pressures ranging from ambient to 50MPa are found to have little effect on thermal conductivity. Some researchers have also acknowledged effects from the composition of the salt, from pure NaCl to

salt with up to 20% insoluble impurities (Durham et al., 1983; Sweet and McCreight, 1979, van den Broek, 1982). Additional work has determined thermal conductivity for bedded salt, with no systematic focus on variables within the salt (e.g., Liu et al., 2011). Birch and Clark (1940a) developed an early data set for single crystal halite using a guarded heat flow device designed to measure thermal resistance of an unknown material; thermal conductivity is the reciprocal of thermal resistivity.

In Figure 3 we present and summarize measurements from many workers of their measurements on halite and rock salt from 0° to 650°C.

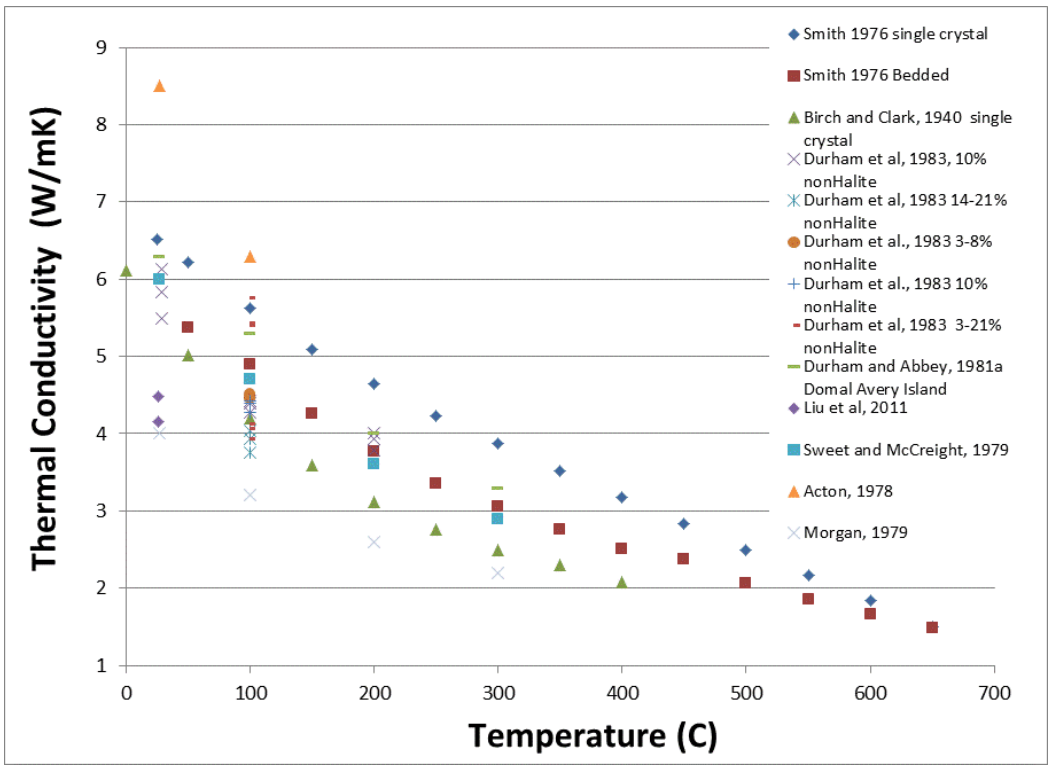

Figure 1. Summary of salt thermal conductivity data from previous work

Accurate knowledge of thermophysical properties during crushed salt reconsolidation is extremely important to meaningfully model scenarios where crushed salt is emplaced with high-level radioactive waste, and is allowed to consolidate to form a barrier. Crushed salt backfill's thermal and mechanical performance at elevated temperature requires a solid understanding of material properties during reconsolidation at elevated temperature. Also, reconsolidating salt properties vary with density/porosity.

This study determined thermal conductivity (the ability of a material to conduct heat), thermal diffusivity (the measure of thermal inertia), and the specific heat (the amount of heat per unit mass required to raise the temperature by one degree Celsius). The physical mechanisms resulting in the observed changes of these thermal properties are beyond the scope of this study.

Little work has been done to determine the effect of variable porosity on salt thermal conductivity. Naturally occurring salt tends to have low porosity, from 0% for individual crystals

to roughly 2–3% for polycrystalline samples. Limited work has been done on salt samples with higher porosity (Acton, 1977), but this work was not designed to systematically analyze the effect of porosity. It was instead focused on samples of variable grain and crystal size.

The most comprehensive existing dataset is from Bechthold et al., (1999) and Bechthold et al., (2004), the combined data from which provide a fairly complete range of salt thermal conductivity values from 0–40% porosity. Our work intends to verify and augment these data by systematically measuring porosity effects in a single test series and at temperatures from 100–200°C. This will analyze the simultaneous dual controlling effects of porosity and temperature. This project does not currently focus on pressure effects, as salt thermal conductivity has been shown to be independent of confining pressure (e.g., Durham, et al., 1983; Durham, Boro and Beiriger, 1984).

A generalized equation—the geometric mean of rock conductivity and pore conductivity—is used to model the bulk thermal conductivity of a two-medium material is found in Ingebritsen et al. (2006, citing Sass et al., 1971):

$$K_b = K_r^{1-n} K_f^n \qquad (1)$$

where *K* is thermal conductivity, *n* is porosity, and *b*, *r*, and *f* denote bulk, rock, and fluid properties, respectively. Using values for salt (rock) and air (pore fluid) at different temperatures (Table 1) creates an estimate of the range of values likely to be encountered in this work (Figure 2). In this report, this is the model we sought to evaluate, populate and use in the analyses of the data we have generated.

	25°C	50°C	100°C	150°C	200°C
K_{salt} (W/mK)	6.049	5.488	4.658	3.897	3.376
K_{air} (W/mK)	0.026	0.028	0.032	0.035	0.039

Table 1. Salt thermal conductivity values measured from single-crystal samples.

Air thermal conductivity values were calculated using the expression:

$$\mathbf{K = 1.5207(10^{-11})(T^3) - 4.8574(10^{-8})(T^2) + 1.0184(10^{-4})(T) - 0.00039333}$$

where K is thermal conductivity (W/mK) and T is temperature in Kelvin.

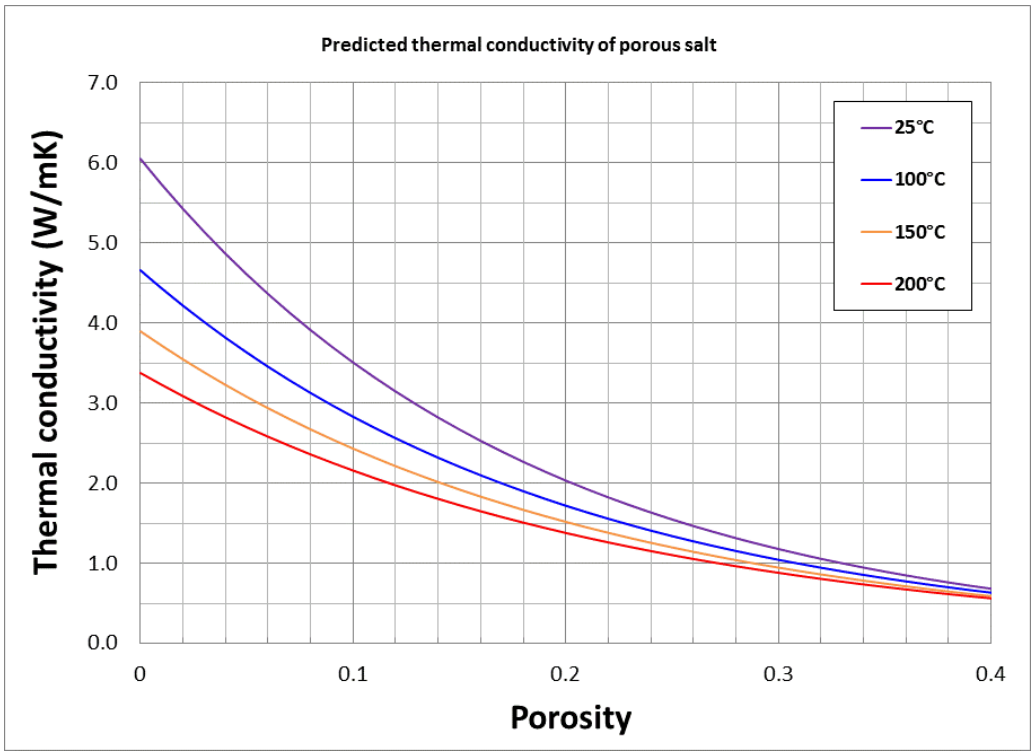

Figure 2. Predicted thermal conductivity values of crushed salt over a range or porosities and temperatures.

2. EXPERIMENTAL METHODS

2.1 Preparation of salt

Material for samples includes loose mine-run (crushed) salt from the Waste Isolation Pilot Plant and cohesive bedded polycrystalline domal salt (Port Barre Salt Dome, LA) and single-crystal (Hockley Salt Dome, TX) salt (Figure 3). The bulk of testing is performed using the mine-run salt, which can be easily compacted into sample pellets of variable porosity, thickness, and grain size (Figure 2). This salt is mined from a radioactive waste storage facility and therefore represents the likely mineralogy of a storage site. The sample material used in this work includes 1.0–1.6% water-insoluble Impurities. X-ray diffraction analysis of this material (Appendix 4) shows that it closely resembles results from Stein (1985), who identified up to 5% soluble and insoluble impurities in mine-run salt, including quartz, gypsum, and clays. Domal salt has naturally low porosity and is useful for completing the low-porosity region of the thermal conductivity curve, as it is difficult to achieve porosities in the 0–2% range simply by compacting crushed salt. Domal salt is relatively pure NaCl, however, and contains fewer of the impurities present in the mine-run salt.

Figure 3. From left to right: Mine-run crushed salt; die-pressed pellet of mine-run salt; core of relatively pure polycrystalline bedded salt; single-crystal salt core. Scale in inches.

Grain size distribution is estimated by sieving all salt before testing. Grains larger than 9.5 mm in diameter were removed. The grain size distributions of crushed salt used in these experiments is included in Tables 2 and 3, and plotted in Figure 4.

Mine Run WIPP Salt 9/9/10		
Mesh size (mm)	Weight (g)	Weight percent
0.00	437.4	15.33%
0.60	196.0	6.87%
1.00	169.4	5.94%
1.40	364.0	12.75%
2.00	208.9	7.32%
2.36	194.5	6.81%
2.80	95.5	3.35%
3.35	82.4	2.89%
4.00	89.9	3.15%
4.75	212.4	7.44%
6.30	386.5	13.54%
9.50	417.1	14.61%
Total	2854.0	100.00%

Table 2

WIPP Crushed Salt, Sample No. WIPP_N940_041912		
Mesh size	Weight (g)	Weight percent
0.00	467.1	10.52%
0.60	521.6	11.74%
1.00	323.7	7.29%
1.40	334.9	7.54%
2.00	243.5	5.48%
2.36	248.4	5.59%
2.80	211.8	4.77%
3.35	218.0	4.91%
4.00	264.8	5.96%
4.75	425.3	9.58%
6.30	532.9	12.00%
9.50	649.1	14.62%
Total	4441.1	100.00%

Table 3

Tables 2 and 3. Grain size distribution of two batches of WIPP mine run salt used in these experiments. Grains larger than 9.5 mm were removed and not used to make pellets.

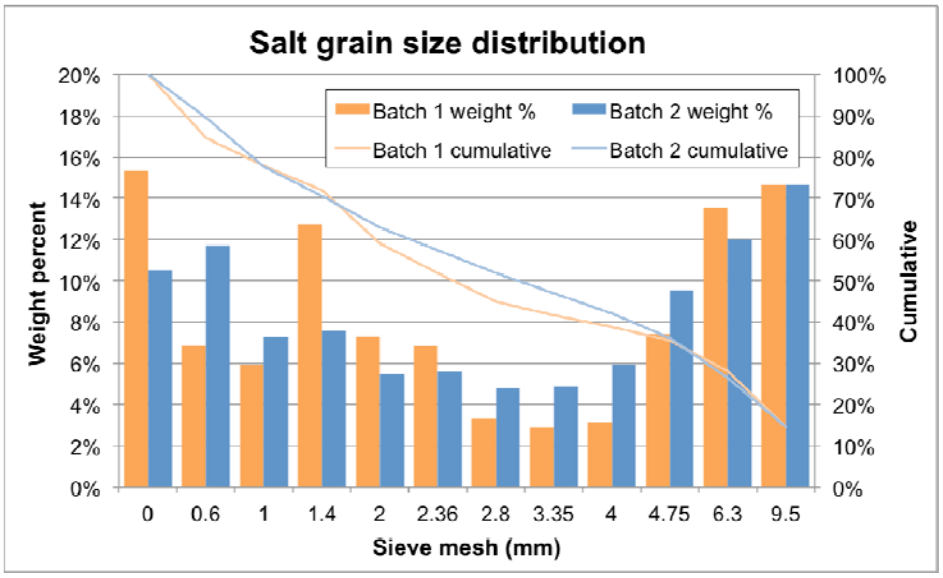

Figure 4. Grain size distribution used in this study (from Tables 2 and 3).

Samples are made by pressing salt from the sieved batch in a 50-mm diameter die, compacting it into circular pellets roughly 25.4 mm tall (see procedure in Appendix 5). The target and final porosity of these samples is calculated by comparing the density of the final pellet (final mass and final volume) to the known density of intact salt (2.140 g/cc; Table 4). Because the TCA system, discussed later, operates by "sandwiching" the sensor between two halves of the same material, two such pellets are pressed for each target porosity. Although some stratification occurs during the pressing process due to grain size sorting, the TCA system measures bulk thermal conductivity throughout the sample, and should therefore average out any local variations in porosity.

2.2 Salt Drying Procedure

Experience has shown drying crushed WIPP salt at 100°C for three days is sufficient to drive off adsorbed water, resulting in a mass loss of roughly 0.1%. Drying for longer than three days does not significantly increase mass loss. During the heating phase to 250°C of mechanical testing of crushed salt samples resulted in observable additional brine loss (Figure 5). In addition to adsorbed water, salt crystals contain abundant fluid inclusions. Crushed salt retains brine even after being heated to 100°C because it is trapped within these fluid inclusions, and that the unexpected volume of water expelled during mechanical testing is drawn from these fluid inclusions as salt crystals shear under pressure.

Figure 5. Brine escaping through vent in crushed salt sample during heating phase of high-temperature (250°C) mechanical testing. Greenish color is a result of reaction with the copper jacket used to contain the sample. The tubing diameter is 0.25".

To remove this excess moisture, more extreme heating may be necessary. We measured additional mass driven off at higher temperatures by weighing crushed salt as it was heated to 400 ^{o}C. Sample material was crushed mine-run salt from the Waste Isolation Pilot Plant (Figure 6).

Figure 6. Unconsolidated Waste Isolation Pilot Plant mine run (crushed) salt, sifted to remove grains larger than 9.5 mm in diameter. Scales in inches.

Two uncovered tin-plated steel canisters weighing slightly more than 300 g were filled with 2500.0 g of crushed salt each. To maintain consistency with other experiments done in this lab on the thermal and mechanical properties of crushed salt, grains larger than 9.50 mm in diameter were removed by sifting all sample material. Each canister was weighed at room temperature, then placed in an oven at 50°C. Oven temperature was raised by 25°C every three weeks, up to 300°C; temperature was raised by 50°C every three weeks from 300°C to 400°C. This process took 273 days (November 29, 2012 through August 29, 2013), with weight measurements taken roughly two out of every three days. Samples were always weighed immediately before increasing the temperature as well as the day after the temperature increase, during which time the greatest weight loss was observed. The only interruption to heating was caused by a power loss some time between April 30 and May 2. Samples were returned to the same temperature and showed a slight drop in weight consistent with the overall data trend at that time.

Interference with the electronics of a digital scale was prevented by using a metal block to separate the hot sample material from the scale. The scale was zeroed with the block in place before placing the sample material on top of the block. This method also protected the scale from heat damage. In earlier preliminary tests, a phenomenon occurred in which hot canisters would slowly increase in weight as they sat on the scale (outside the oven). The reason for this weight gain is unclear: Re-adsorption of water seems unlikely, as the weight increase occurred while the salt was still well over 100°C. In order to maintain consistency in data collection, canisters were removed from the oven one at a time and placed directly on the scale (atop the separator block). Using a stopwatch, weight was recorded exactly one minute after removing the material from the oven, leaving sufficient time for transporting and situating the canister. This procedure provided an impartial method to record weight if the scale was oscillating between two numbers, and an

arbitrary but consistent “moment of truth” with which to counter the weight increase phenomenon.

A total of 175 measurements were made on Canister 1, measuring a change of -11.9 g, for a weight loss of 0.48%. A total of 174 measurements were made on Canister 2, measuring a change of -12.1 g, for a weight loss of 0.48%. Changes in both samples mirrored each other closely throughout the experiment (Figure 7). The dramatic drops at 350°C and 400°C are in part due to the greater increase in temperature at those times (50°C as opposed to 25°C); even so, the loss is greater than at most other consecutive 25°C intervals and is attributed to polyhalite dehydration as observed previously in this rocksalt (Roedder, and Bassett. 1981).

Over this temperature and time period, the maximum weight per cent water in these samples is on the order of 0.45% (using 400°C as the completely dry weight) as shown in Figure 8. It is apparent that water is retained in the samples for all of the temperatures of repository interest (approximately $\leq$300°C). Measurements over this time and temperature range were limited by lab practicalities. Future observations of this salt will inform us if fluid is retained in these samples.

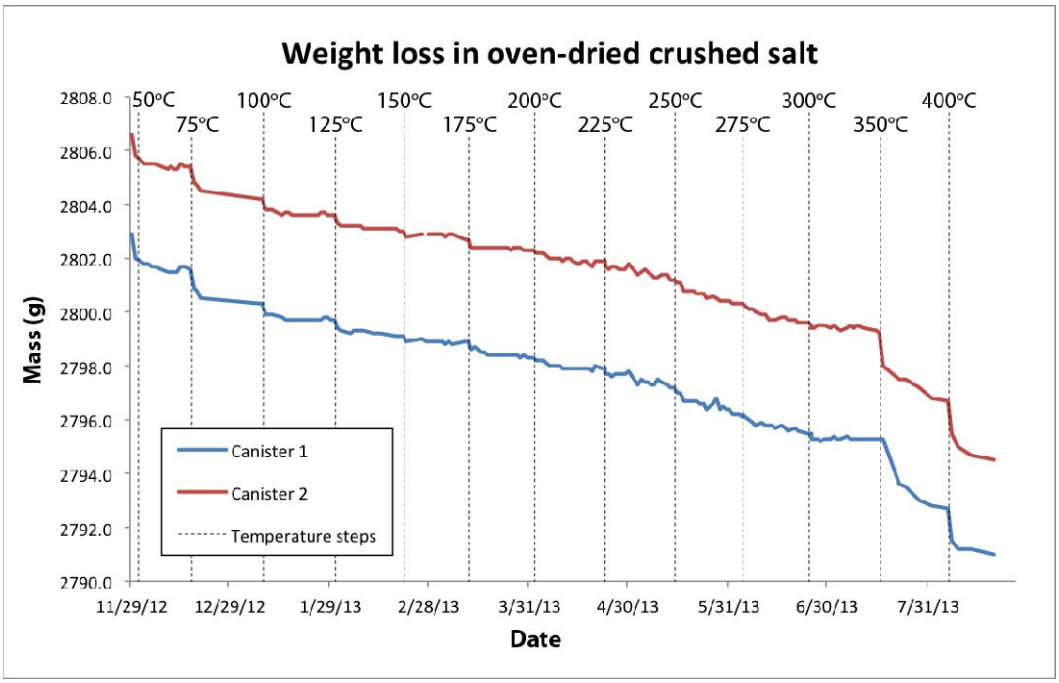

Figure 7. Salt drying data from two canisters. Mass includes the weight of the can (slightly over 300 g).

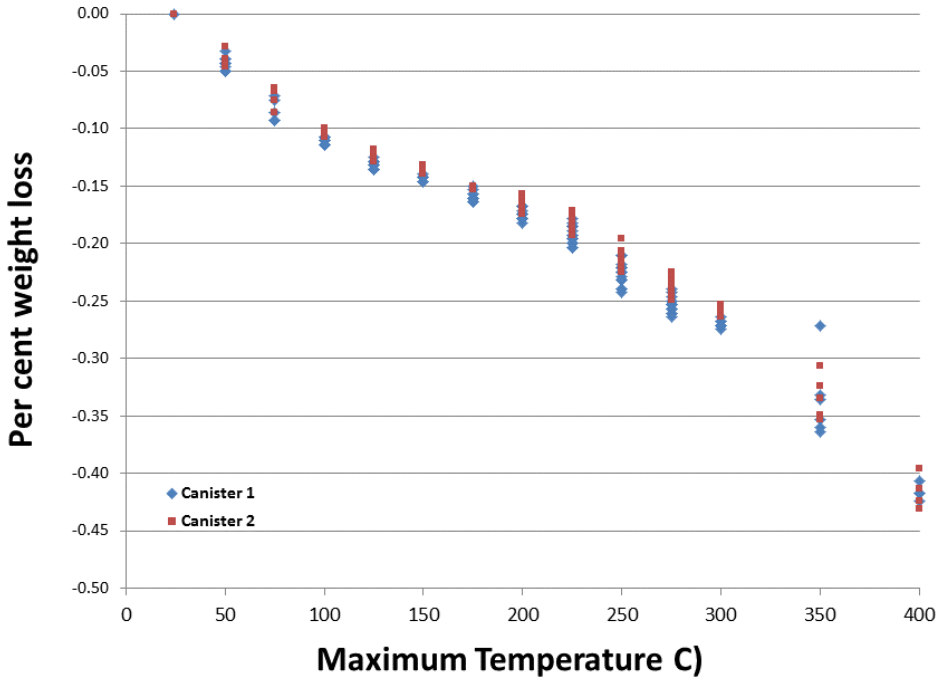

Figure 8. Per cent weight loss versus maximum temperature

2.3 Thermal Conductivity Measurement Methods

Two methods were utilized in this study to determine thermal properties.

2.3.1 Holometrix TCHM-LT

The Holometrix TCHM-LT thermal conductivity instrument (TCHM) is a guarded heat flow meter designed to measure thermal resistance of an unknown material. The guarded heat flow method measures and compares the temperature gradient across a sample to the flow of heat through the sample in order to calculate the thermal resistance of the sample. Knowing sample thickness, the system calculates the thermal resistivity of the sample; sample thickness is measured at test temperature. Thermal conductivity is the reciprocal of thermal resistivity.

To make these calculations, a sample is placed in the TCHM test stack and the stack is clamped shut by a load of 70 psi, provided by bottled nitrogen (Figure 9).

When the sample is clamped, its upper and lower surfaces contact, respectively, an upper heated plate and a heat flux transducer mounted above a lower heated plate (Figure 10). The temperature of each plate is controlled by an attached heater. The lower heater is always hotter than the upper heater, resulting in heat flow from the lower sample surface to the upper sample surface. The heat flux transducer measures the amount of heat passing through the sample (Q).

Figure 9. From left to right: The test stack in the opened position, ready to be loaded; the test stack with sample loaded, ready to be clamped; the test stack clamped by bottled nitrogen (out of sight) at 70 psi.

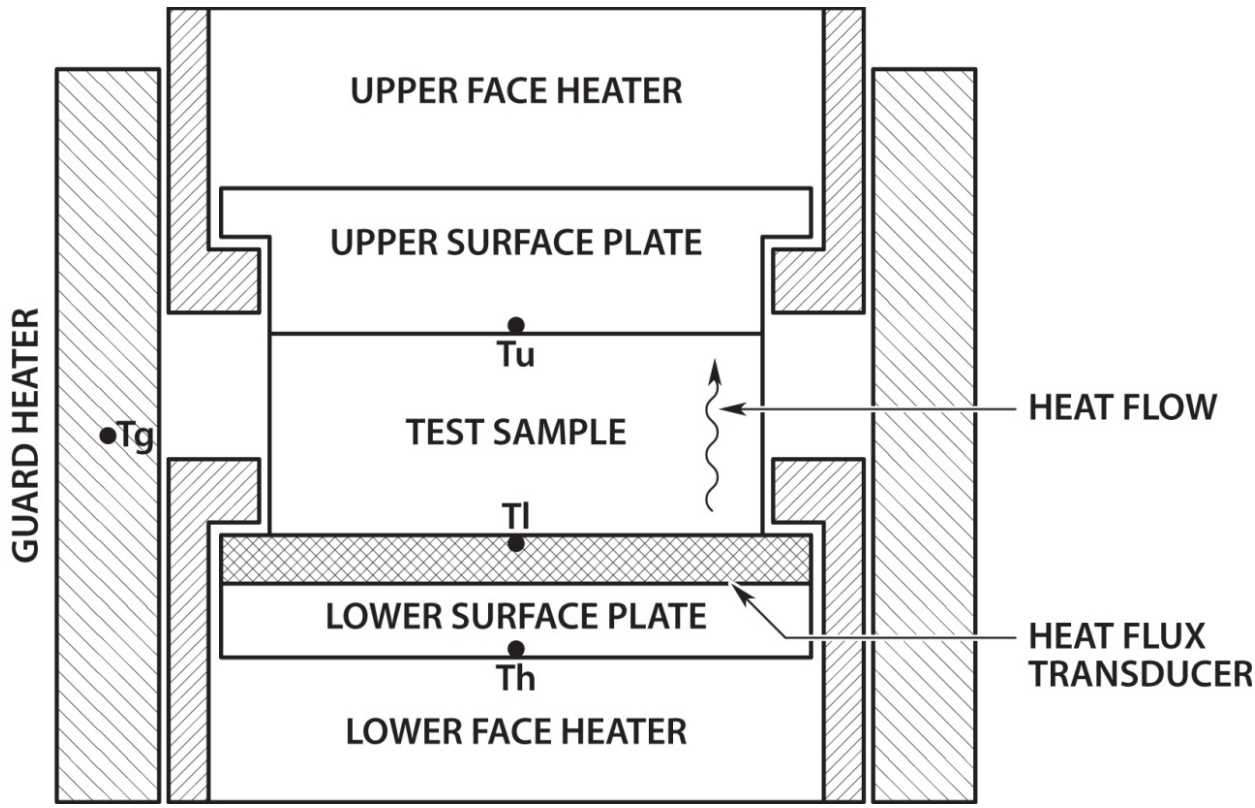

Figure 10. Schematic diagram of the TCHM test stack assembly. Note thermocouples at the upper (T_u) and lower sample surfaces (T_l), in the guard heater (T_g) and at the lower heater (T_h). The lower heater is the reference point by which the upper and guard heaters maintain a constant temperature difference.

Thermocouples record temperature at the lower heater (T_h); the lower sample surface, or interface of the sample with the heat flux transducer (T_l); and the upper sample surface, or interface of the sample with the upper plate (T_u). A differential controller uses feedback from these thermocouples to maintain a fixed temperature difference across the test stack (T_h-T_u) of 25–30°C. As temperature in the lower heater increases or decreases, so does temperature in the upper heater. The heater-plate-sample assembly is surrounded by a cylindrical guard heater to minimize heat loss from lateral heat transfer (Figure 7). A thermocouple (T_g) is embedded in the guard heater. A differential controller uses feedback from this thermocouple and another in the lower heater to maintain a fixed temperature difference between the lower and guard heaters (T_h-T_g) of 15–20°C. The guard temperature is maintained at roughly the mean sample temperature. To calculate thermal conductivity, the TCHM measures thermal resistance of the sample using the equation:

$$R_s = N\left(\frac{T_l - T_u}{Q}\right) - R_o = \frac{d}{K}$$

Where R_s is sample thermal resistance (m^2K), N is a proportionality constant, Q is heat flow (W/m^2), R_o is the sum of contact thermal resistances (m^2K)within the system, and *d* is sample thickness (m). Dividing by *d* removes the thickness term and gives sample thermal resistivity, which is the reciprocal of sample thermal conductivity. The system calibration solves for N and R_o, which are constants for any given method of assembling the sample. During testing, the TCHM determines the ratio $(T_l-T_u)/Q$, or $\Delta T/Q$, for every specified temperature set point.

TCA200 software (TCA) controls the system and records data. The TCA records temperature and heat flow every 60 seconds. The average $\Delta T/Q$ ratio is recorded after every 10 scans. After 2 blocks of 10 scans, the TCA checks that all ratios within the second block are within 1% of each other. If they are, then the sample is at equilibrium and the system can move on to the next temperature set point. If not, then the TCA checks that the average ratio of the second block is within 1% of the average ratio of the first block. If it is, then the sample is at equilibrium and the system can continue to the next temperature set point. If not, then additional blocks of 10 scans will be performed until the sample reaches equilibrium. The TCHM can reach a maximum sample temperature of 200°C. A circulating water bath provides liquid-cooled heat sinks near the upper and lower heaters (Figure 11) to protect the TCHM from heat damage as well as enabling a lower minimum test temperature. Using tap water, the minimum sample temperature is 40°C, although this can be reduced to -100°C by using other coolant liquids such as liquid nitrogen.

The TCHM can measure thermal conductivities from 0.1–10 W/mK, or a thermal resistance range of 0.001–0.050 m^2K/W. The estimated accuracy is 2–5% when sample thermal resistance is greater than 0.005 m^2K/W and 5–10% when thermal resistance is less than 0.005 m^2K/W. We therefore ascribe an accuracy of ~5% to thermal resistance measurements with better accuracy at higher resistance and/or thickness.

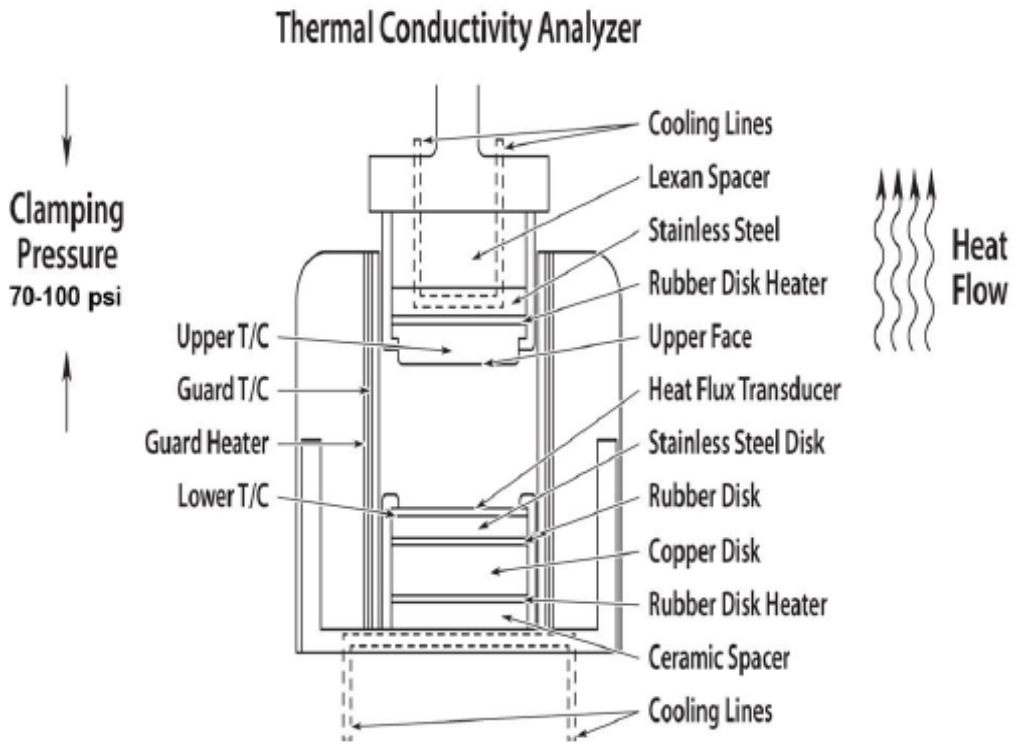

Figure 11. Detailed schematic of the TCHM test stack. Note cooling lines directed past the upper and lower heaters.

2.3.1.1 TCHM System Calibration

Calibration of the TCHM is essential for accurate data analyses. The calibration solves for the constants N and R_o in the equation discussed above. This enables sample assemblies to take any form necessary by predetermining, over a range of thermal resistances, the built-in thermal resistance unique to that setup. Because the process assesses built-in factors affecting thermal resistivity over the entire system, the TCHM must be recalibrated whenever:

- there is a change in the compressive load on the test stack;
- there is a change in the temperature difference between the upper/lower or guard/lower heaters
- the heat flux transducer is replaced;
- or the method of sample assembly is changed.

Calibration of the TCHM can take up to a week. The calibration process measures the thermal resistivity of a known material—either fused quartz or Pyrex—over a range of sample resistances estimated to be appropriate for the materials later to be tested as determined by a literature survey. The TCA then verifies the calibration by using the calibration to determine the thermal conductivity of an "unknown" known material, i.e. separate calibration standard—either Pyrex or fused quartz, whichever was not used at first. If the results are within acceptable error (nominally 5%) of the known thermal conductivity value, then the calibration has been successful. If samples have resistance greater or lower than the extremes of the calibration, the TCA will project from the calibration in order to estimate N and R_o at higher or lower resistivities (Figure 12). This is done by matching a linear or quadratic equation, as necessary, to the slope of calibration data. Ideally, however, the calibration will cover the full range of resistivities necessary.

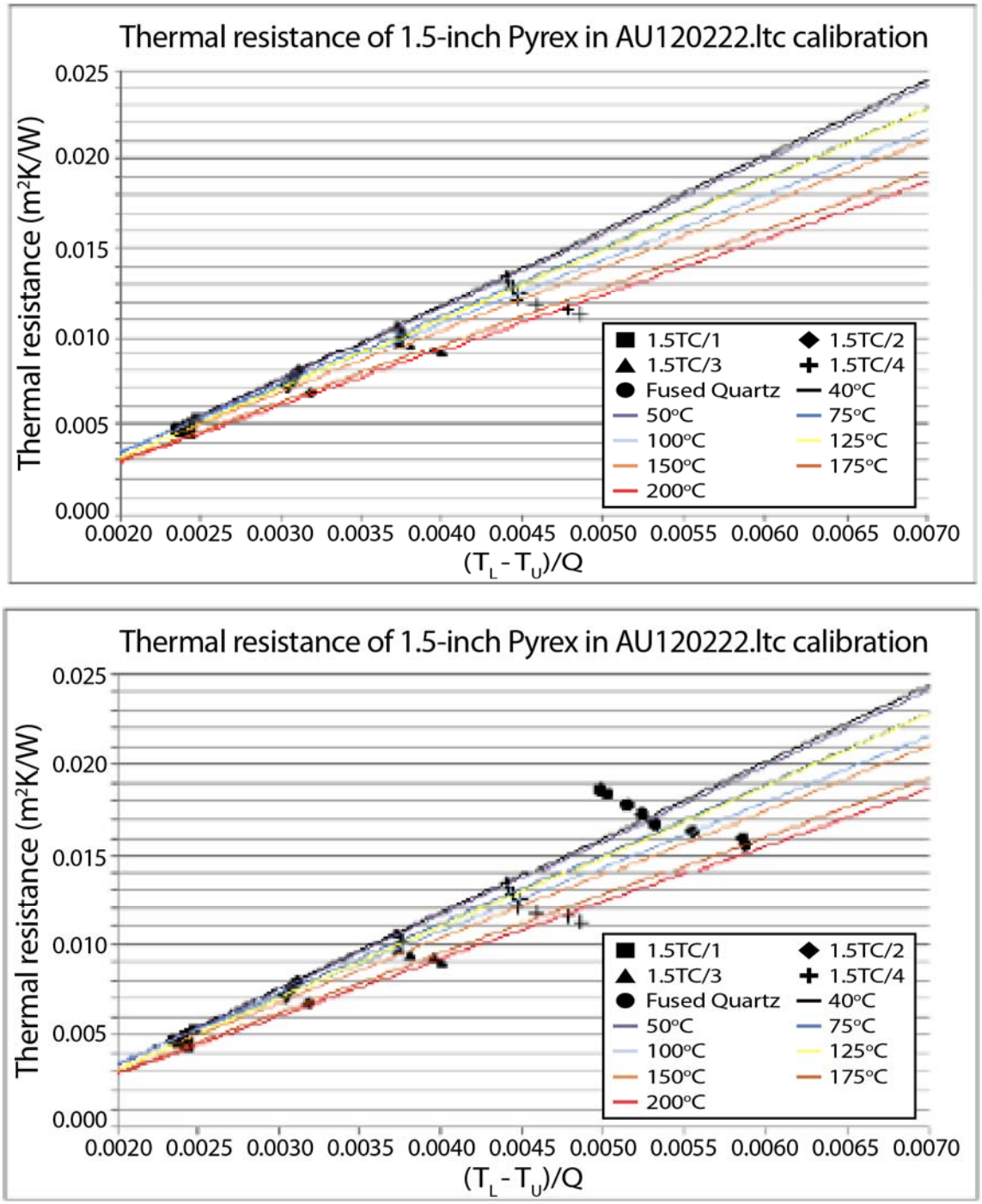

Figure 12. Top: Sample resistance data from a calibration run of 4 Pyrex samples at 8 temperatures from 40°C to 200°C; Bottom: a fused quartz verification sample has higher resistance than any of the Pyrex calibration samples, but its resistance can be estimated by projecting from the calibration data.

For an effective calibration run, at least three samples (fused quartz or Pyrex) of different thickness must each be tested over the full temperature range of interest and using the intended sample assembly. The different thicknesses will define the calibration's upper and lower resistances, so it is helpful to choose samples from the full range of acceptable thickness (~4–20 mm). The calibration temperatures (mean sample temperature, represented by the guard temperature T_g) should be in increments of 25°C or 50°C to develop a well-constrained calibration curve. A simple calibration might run from 50°C to 200°C and include 3 fused quartz samples with thicknesses 5 mm, 10 mm and 20 mm. For each of these samples, a calibration test could be performed with temperature set points at 50°C, 100°C, 150°C, and 200°C. After performing these tests, a verification run could be performed on a 10-mm-thick Pyrex sample. The verification run will calculate the thermal conductivity of Pyrex at each temperature set point and compare it to known values at that temperature. Calibrations are used to account for the thermal resistivity of other materials in the sample assembly.

The system calibration used for this work consists of seven 38.1-mm-diameter fused quartz disks assembled in the sample setup. These disks have thicknesses of 5 mm, 6 mm, 9 mm, 12 mm, 15 mm, 18 mm, and 20 mm. Each fused quartz sample is measured in increments of 25°C from 50°C to 200°C. The verification test is done with a 19-mm-thick, 38.1-mm-diameter Pyrex sample assembled in the same way.

2.3.2 Hot Disk Thermal Constants Analyzer (TCA)

Thermal measurements were made at ambient pressure and moisture conditions using a transient method based on the theory of the transient plane source technique. All property determinations were made with each measurement using the same apparatus, a Hot Disk® Thermal Constants Analyzer (TCA). The apparatus employs a transient plane source device which is used to measure material thermal transport properties—thermal conductivity, thermal diffusivity and specific heat. The transient plane source method uses a plane sensor to function simultaneously as a heat source and resistance thermometer able to detect temperature changes ≥ 0.1 mK. The sensor is sandwiched between two samples of the material to be tested. Passing a current through the sensor increases its temperature by as much as a few degrees and causes a pulse of heat to enter the sample material. The ability of the sample material to conduct heat away from the sensor affects the temperature increase of the sensor. By monitoring the change in sensor temperature over time, therefore, the TCA system can deduce the thermal conductivity of the sample.

Using a nickel sensor embedded in a Kapton or mica coating, the TCA device used in this work (the ThermTest TPS1500 model) can make measurements from cryogenic temperatures to 1000K. The range of measurable thermal conductivities is 0.01–20 W/mK; the maximum measurable specific heat capacity is 5 MJ/m^3K. Samples can be as small as 3 mm in height by 13 mm in diameter, with no maximum limit. In addition to solids, measurements can be made in porous materials, powders and pastes.

The Hot Disk® sensors used for these measurements serve as a heat source to increase sample temperature and as resistance thermometers for recording temperature increase over time. The apparatus includes a programmable oven to house the sample and sensor portion of the test system, and a computer for data acquisition, data analysis, and program control (Figure 13). A

close up of the sample assembly inside the oven is shown in Figure 14. Figure 15 presents images of the single crystal of halite. This crystal was first cleaved and the sensor placed on the cleaved surface for measurements.

Samples are heated from one temperature to the next at 1-2 degrees C per minute; at each temperature the sample equilibrated for a few hours before a measurement was made. Measurements were made at room temperature and at specified temperature intervals up to 300°C.

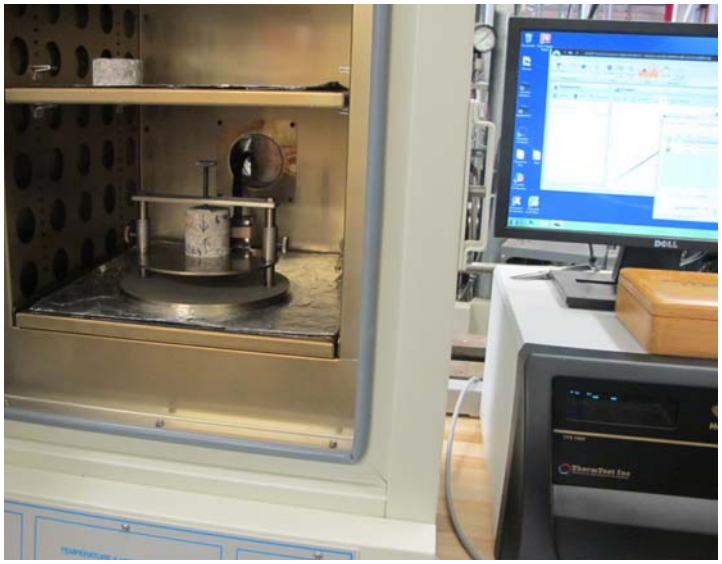

Figure 13. Programmable oven (left) to house the sample and sensor portion of the test system, and a computer for data acquisition (right), data analysis, and program control

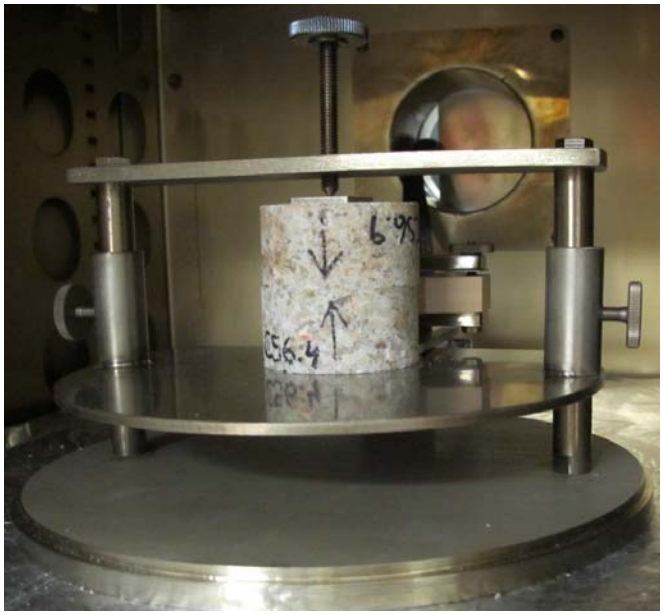

Figure 14. Close up of crushed salt sample in holder in oven. There are two pellets "sandwiching" the sensor film.

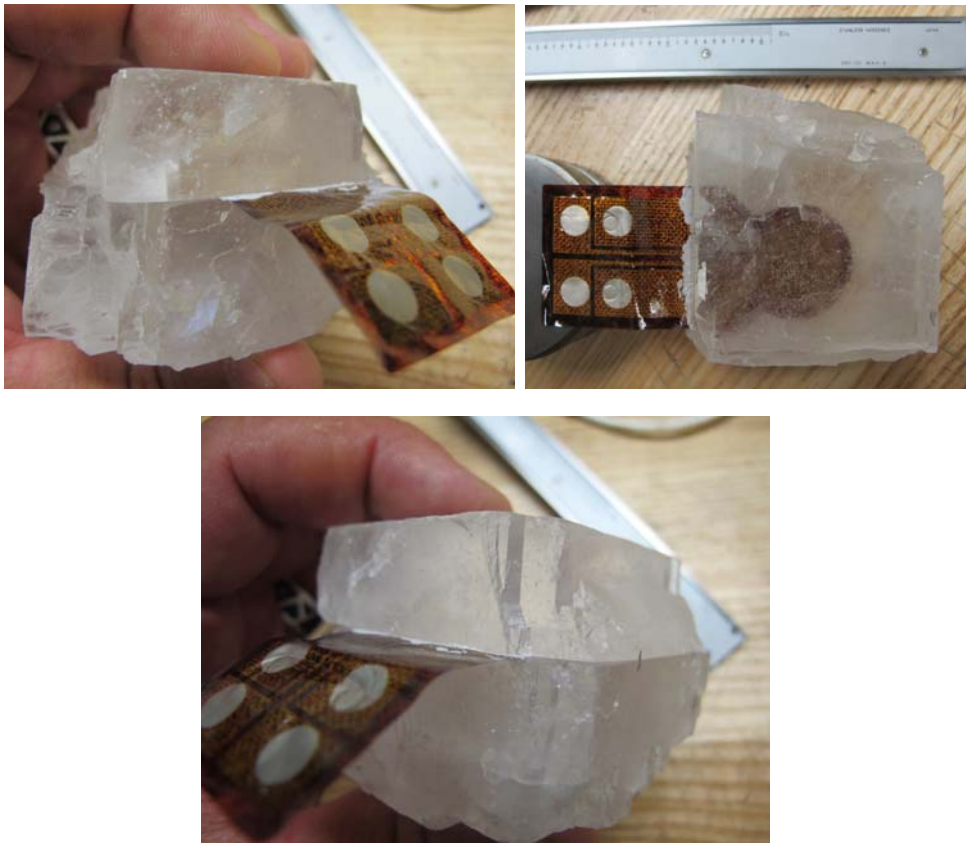

Figure 15. Images of single crystal of halite with TCA sensor positioned upon cleaved surface

3. EXPERIMENTAL RESULTS

Tables of measured properties are provided in Appendices 1, 2, and 3. For presentation and discussion, data are summarized in the following sections through a series of figures. Data presented represents information collected over more than two years of laboratory effort. Early data was collected using the Holometrix device, which provided reliable data, but was limited to temperature up to 200°C, which was cumbersome to use and time consuming to operate and calibrate. The two data sets are from different calibrations. The TCA device was obtained during the project. It allows for determination of the thermal conductivity, thermal diffusivity, and specific heat. The new device required a set-up and learning curve time. This device ultimately became easier to operate with experience gained and more robust. The TCA device facilitated programmable thermal histories to be used, and allowed for ready determination of thermal diffusivity and specific heat to be simultaneously determined. Both data sets are considered equally reliable.

The data are presented in two sections. The first contains the information on single crystal salt utilizing the newer TCA device, the second contains the Holometrix and TCA data on consolidated crushed salt.

3.1 Single Crystal Salt

Thermal conductivity measurements for single crystal salt made using the TCA device are displayed in Figure 16. This data represents a temperature range of 375 ^{o}C (-75°C to 300°C). Halite single crystal thermal conductivity decreases by a factor of 4, from ~10W/mK to ~2.5W/mK. Thermal diffusivity decreases by a factor of 3 for this temperature range, from 5 to ~ 1.5 mm^2/s (Figure 17). Specific heat remains about constant, ~ 2 MJ/m^{3}K for this temperature range (Figure 18). The reproducibility observed through repeat measurements is good.

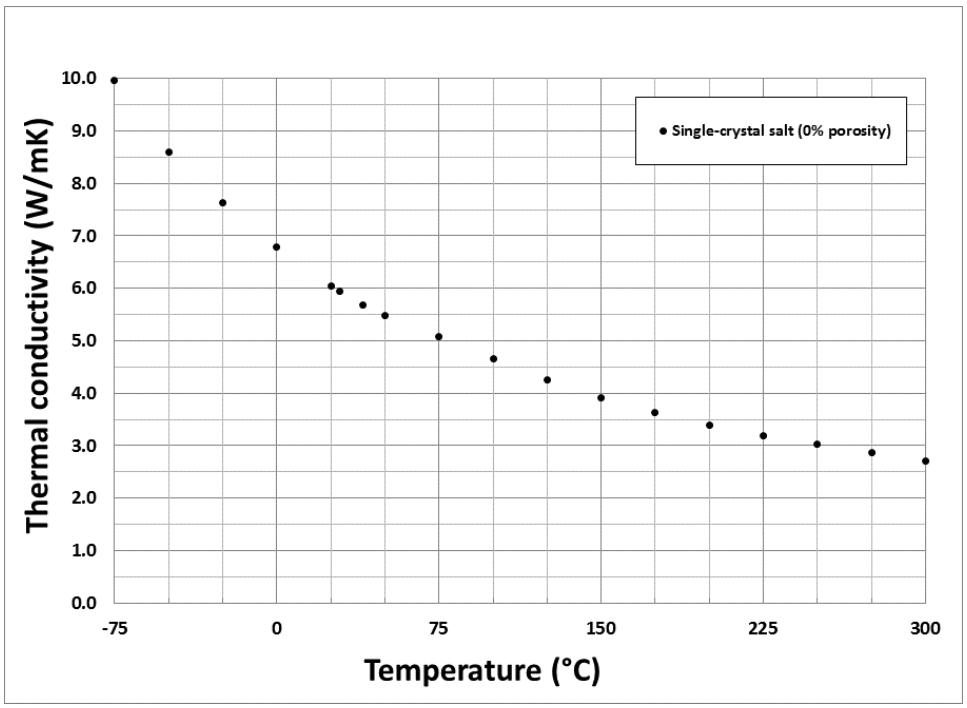

Figure 16. Measured thermal conductivity of single crystal halite.

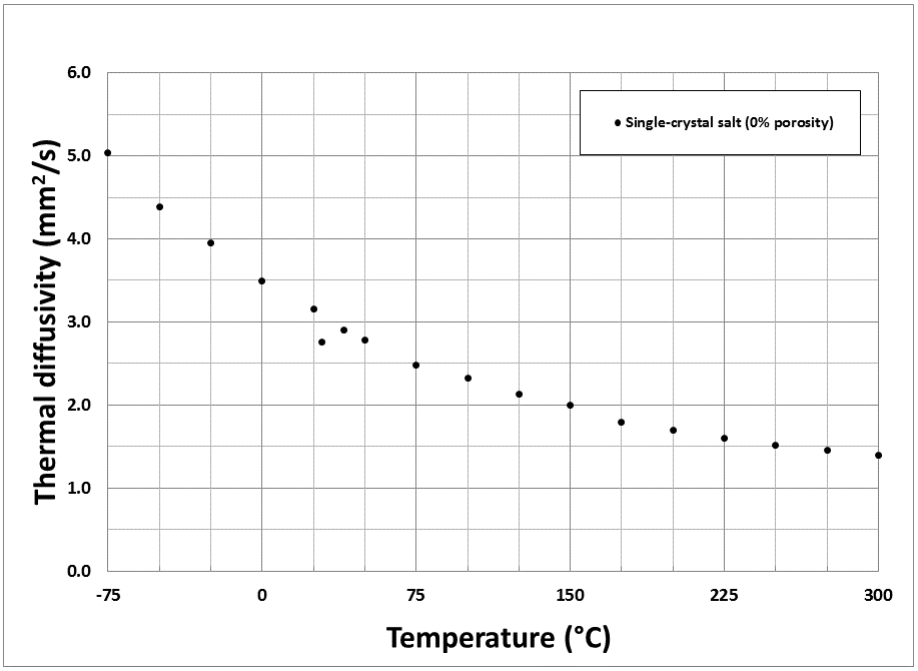

Figure 17. Measured thermal diffusivity of single crystal halite.

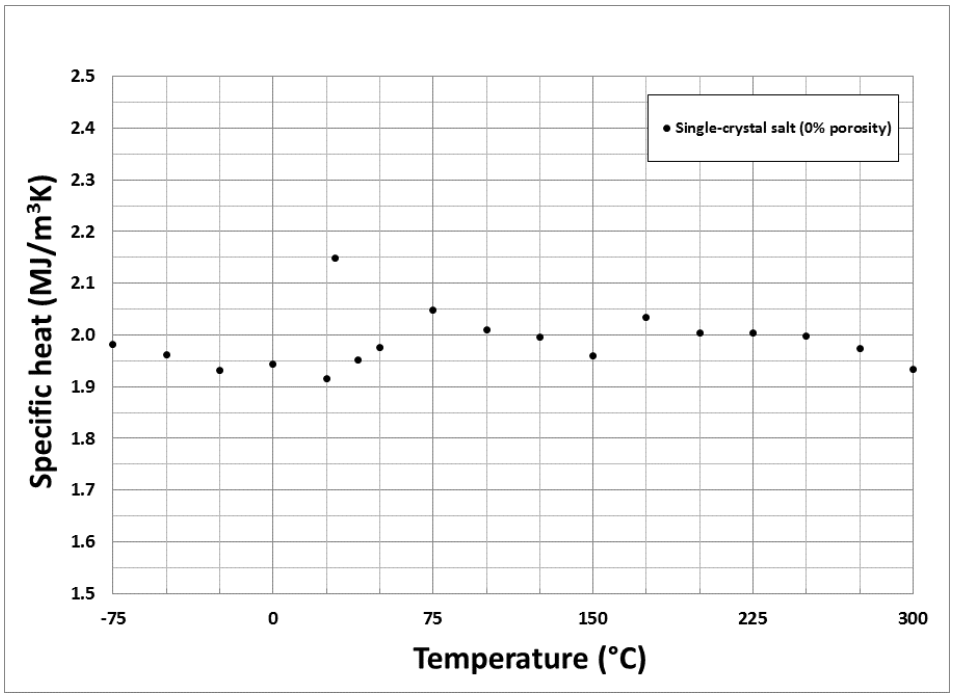

Figure 18. Measured specific heat of single crystal halite.

3.2 Crushed Salt

Thermal conductivity measurements for reconsolidated crushed salt versus porosity and temperature are presented in this section. The porosity range studied in this data set ranges from low porosity, near zero, to that of loose salt, near 40% porosity. Data are initially segregated by temperature. Figures 19, 20, 21, 22, show data for temperatures 25°, 100°, 150°, 200°C, respectively. Data is plotted with the prediction of the mixture theory model, discussed in a later section.

We attribute the small amount of scatter in the data to sample variability, from combinations of slight mineralogic differences, slight differences in grain to grain contacts and uncertainties from the measurement system. This latter reason is considered minor in light of the single crystal data.

Clearly, the thermal conductivity of reconsolidating crushed salt is observed to be both porosity and temperature dependent, with thermal conductivity decreasing with increasing porosity, and increasing temperature.

Measurements using domal salt samples were used to estimate thermal property data in the low-porosity range from room 36°C up to 300°C. Also, the thermal cycling effect upon thermal properties of porous salt was evaluated, in light of potential dewatering effects.

The data set utilized porous salt samples with porosities ranging from ~2.6% to ~17%. The thermal conductivity decreases with increasing temperature (Figure 23). Data measured at 50°C fall slightly below the predicted curve, while data measured at other temperatures show some scatter but fall roughly along the predicted curve. One reason for this could be the learning curve on using the new instrument as the test sequence was underway.

In this test series, 2 sets of samples were cycled up and then down in temperature, while making thermal property measurements (Figure 24). This was done in light of the salt drying data, which indicated that water was liberated from salt during heating. There does not appear to be a significant effect of a single thermal cycle upon the measured thermal conductivity.
Thermal diffusivity, Figure 25 and Figure 26, also decrease with increasing temperature, and appear to be unaffected by thermal cycling. Specific heat (Figures 27, 28) decreases with increasing temperature, and also appears unaffected by thermal cycling.

The effect of temperature on the thermal conductivity, thermal diffusivity, and specific heat are shown in Figures 29, 30, and 31, respectively. For this data set, thermal conductivity appears to be the only thermal property exhibiting a temperature dependence; thermal conductivity decreases with increasing temperature.

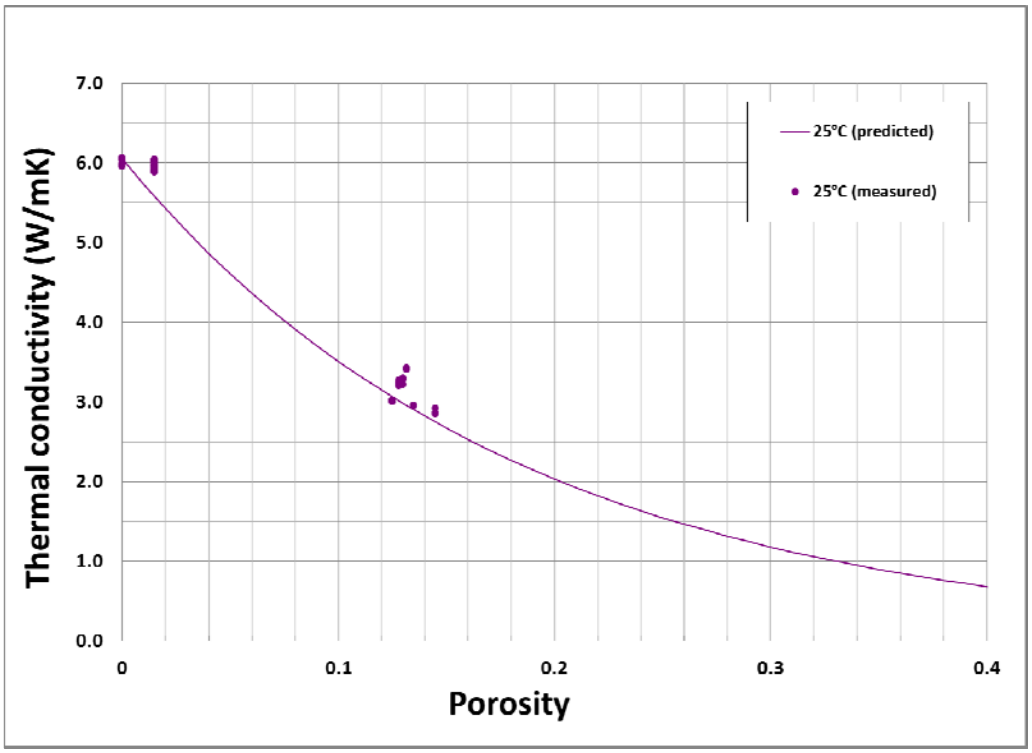

Figure 19. Thermal conductivity versus porosity, 25°.

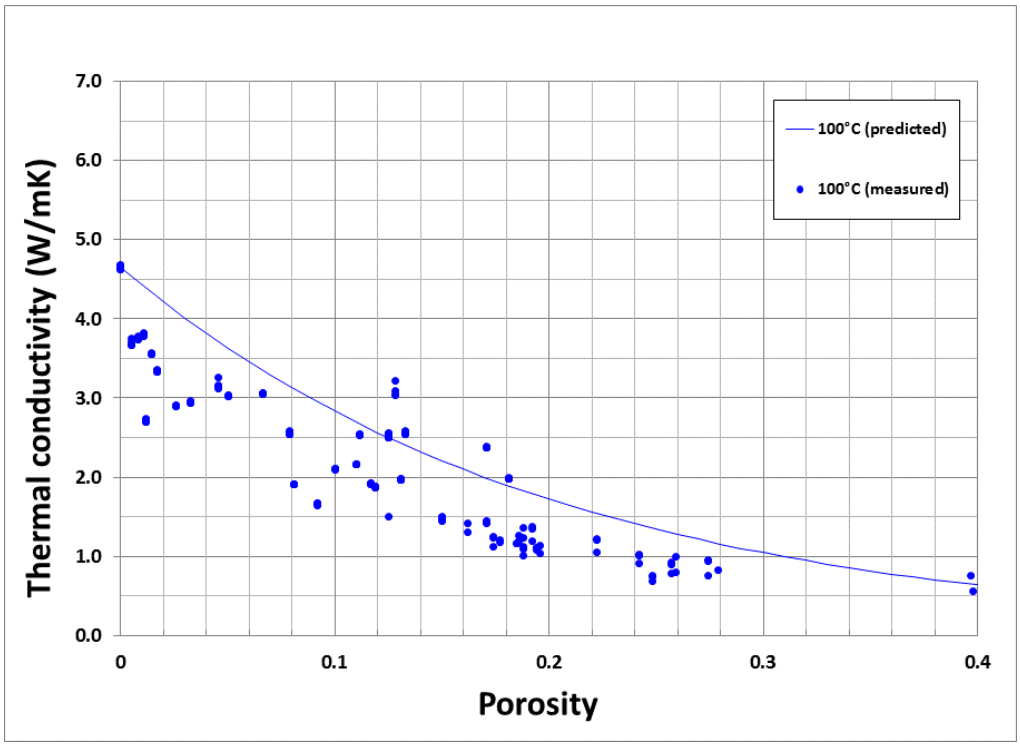

Figure 20. Thermal conductivity versus porosity, 100°.

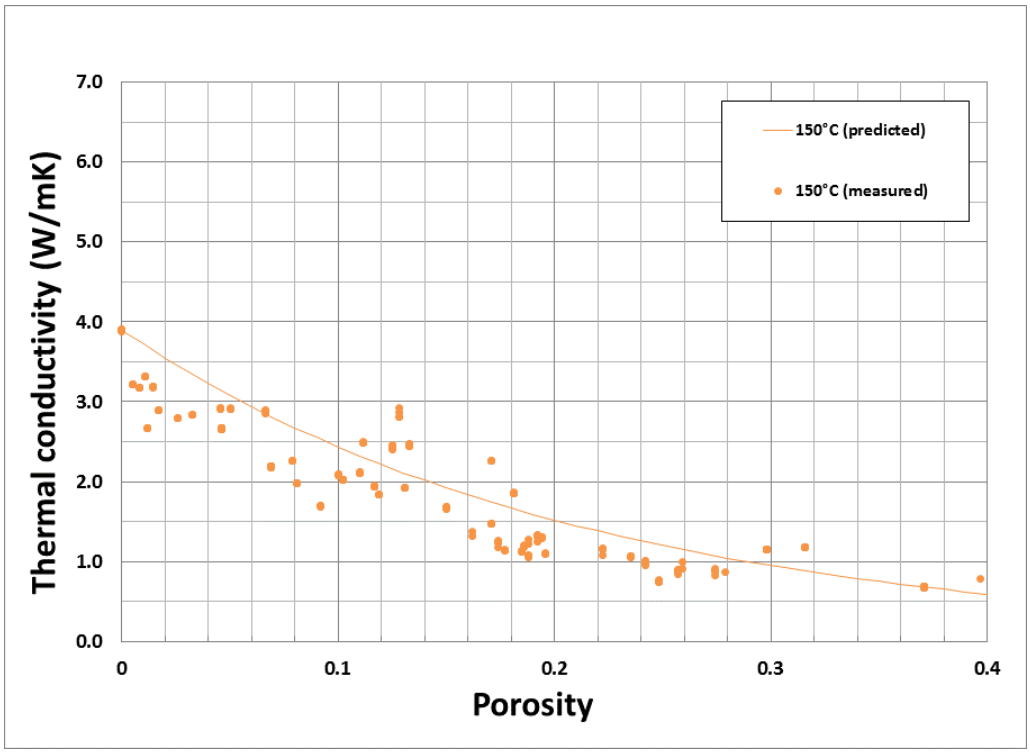

Figure 21. Thermal conductivity versus porosity, 150°.

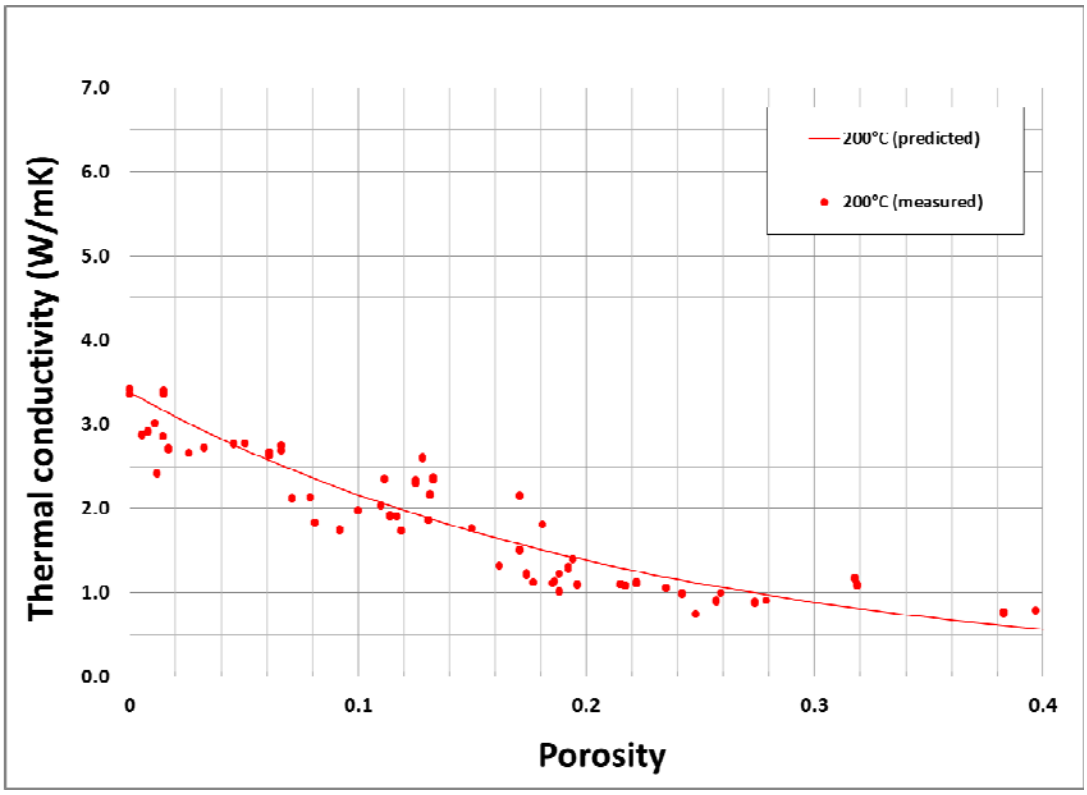

Figure 22. Thermal conductivity versus porosity, 200°.

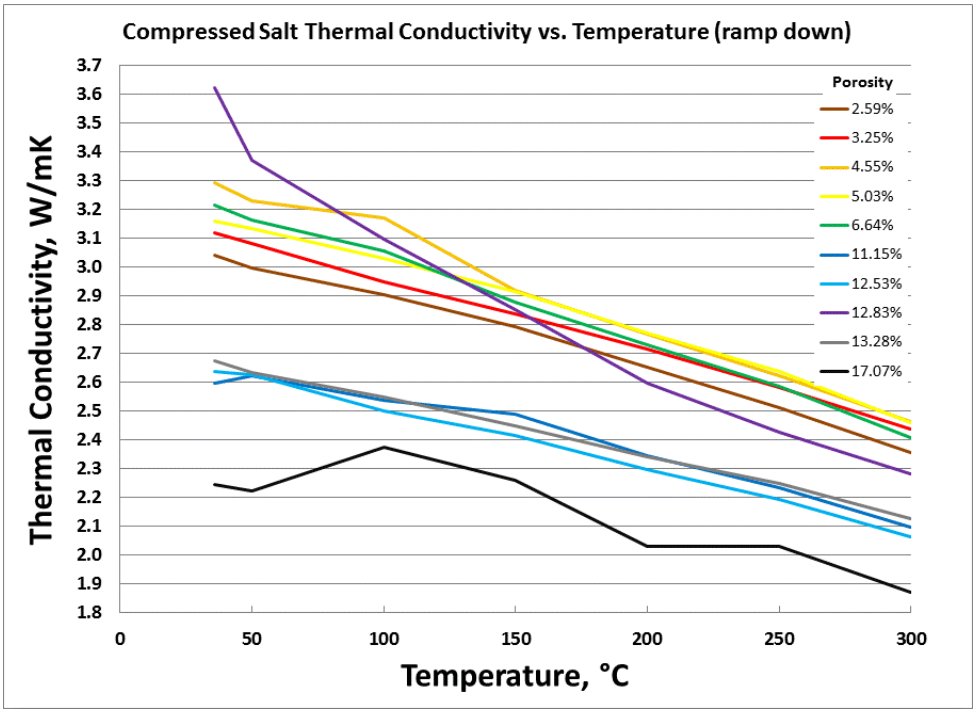

Figure 23. Thermal conductivity of porous salt versus temperature

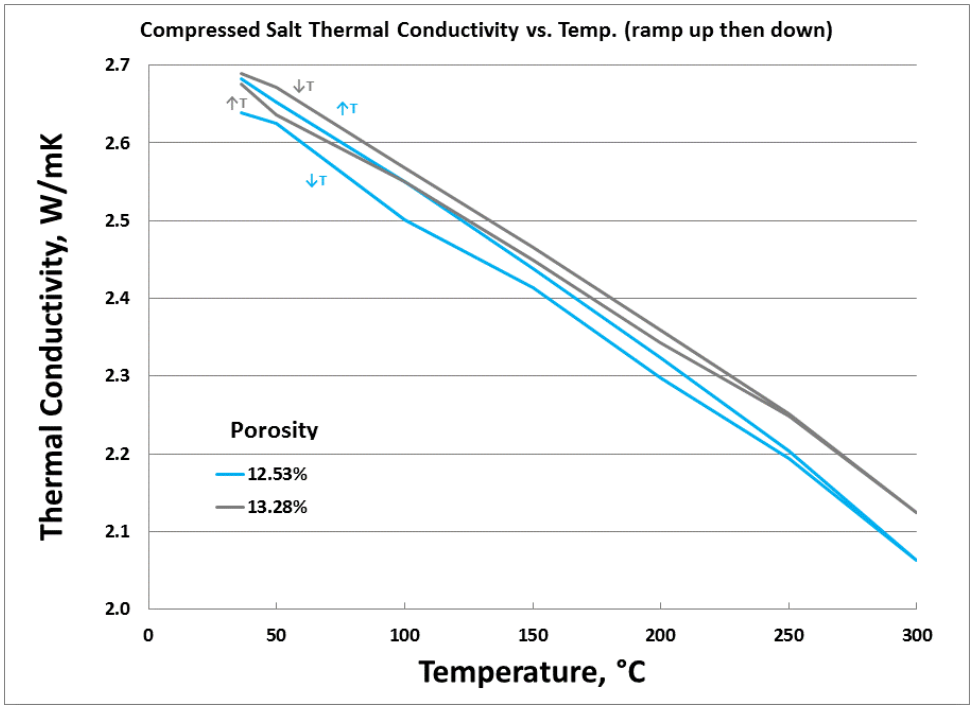

Figure 24. Thermal conductivity of porous salt versus temperature for samples ramped up in temperature, and then down in temperature

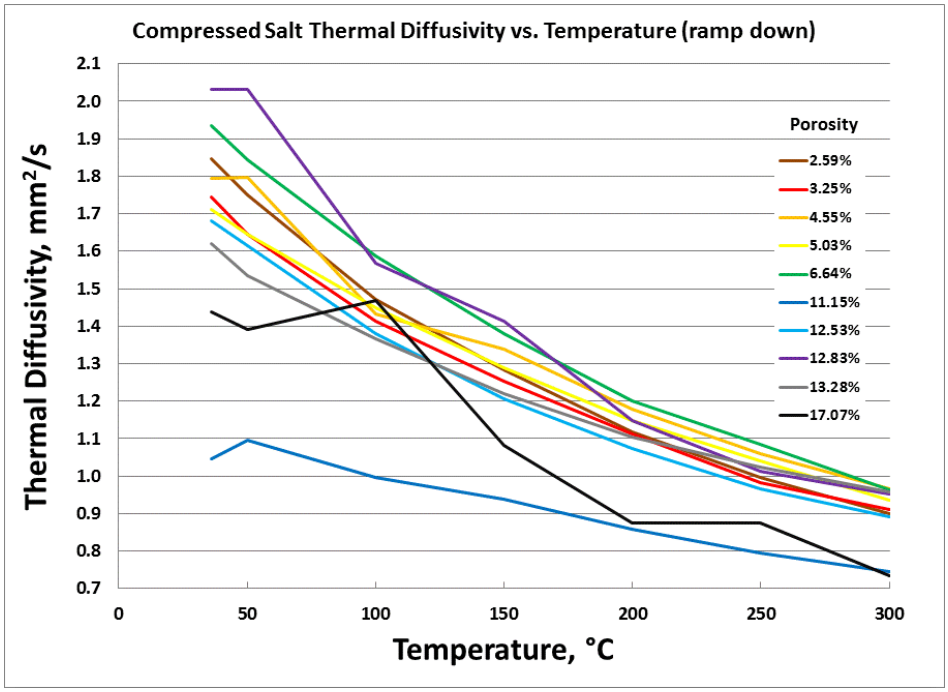

Figure 25. Thermal diffusivity of porous salt versus temperature

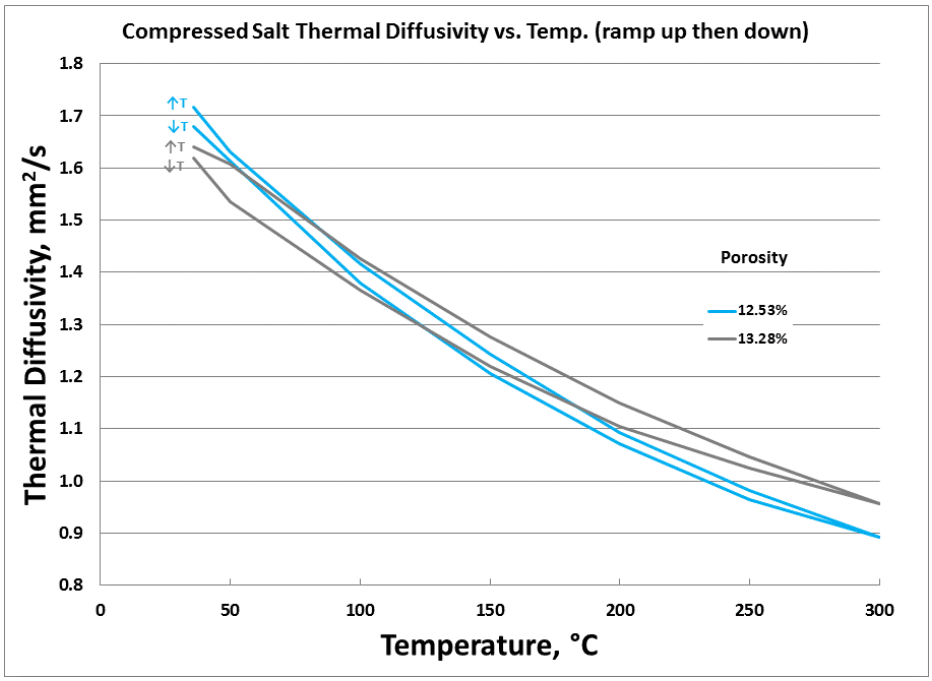

Figure 26. Thermal diffusivity of porous salt versus temperature for samples ramped up in temperature, and then down in temperature

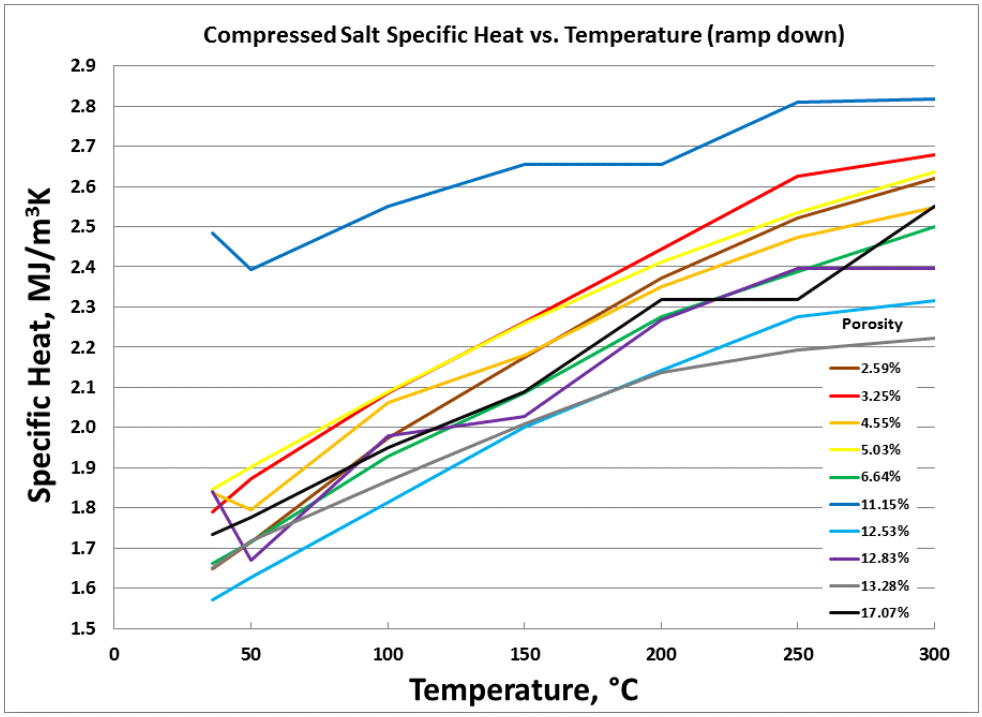

Figure 27. Specific Heat of porous salt versus temperature

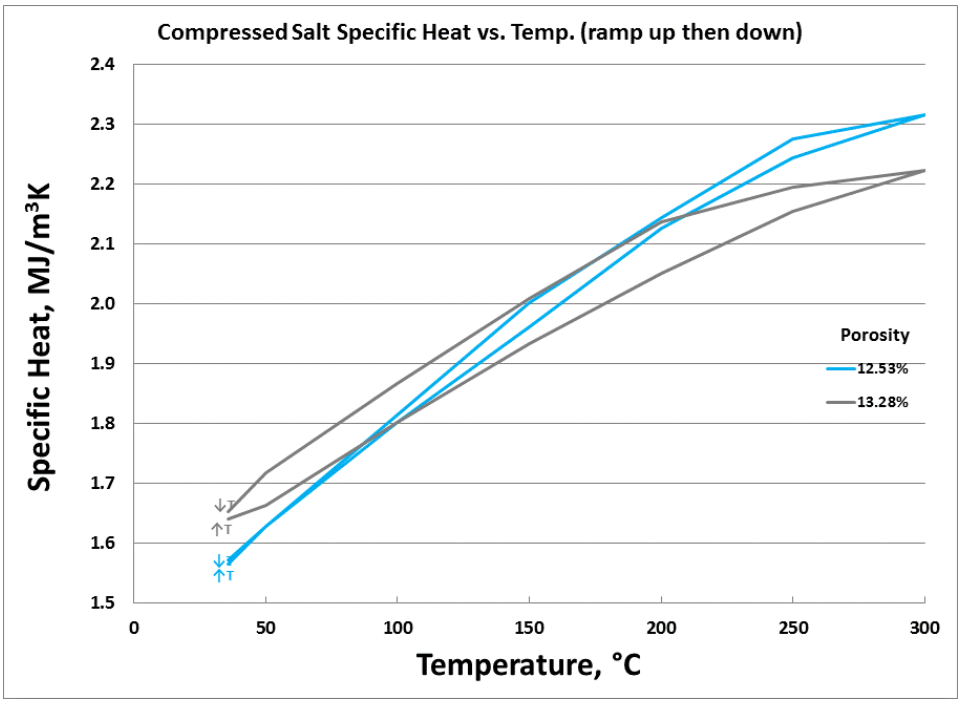

Figure 28. Specific Heat of porous salt versus temperature for samples ramped up in temperature, and then down in temperature

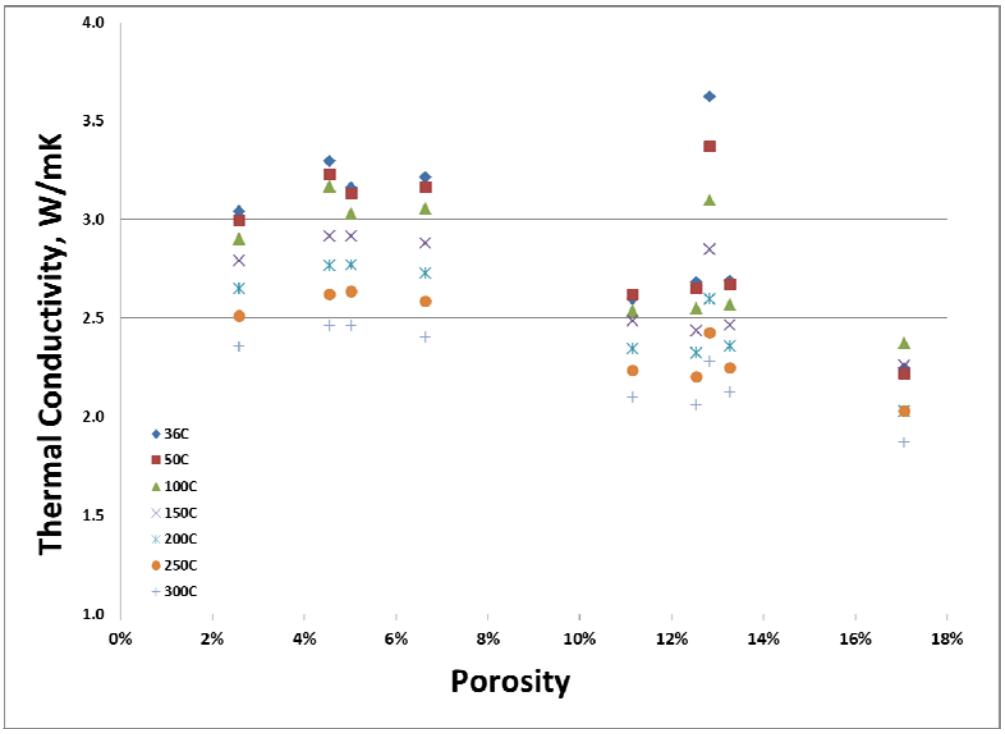

Figure 29. Thermal Conductivity versus porosity

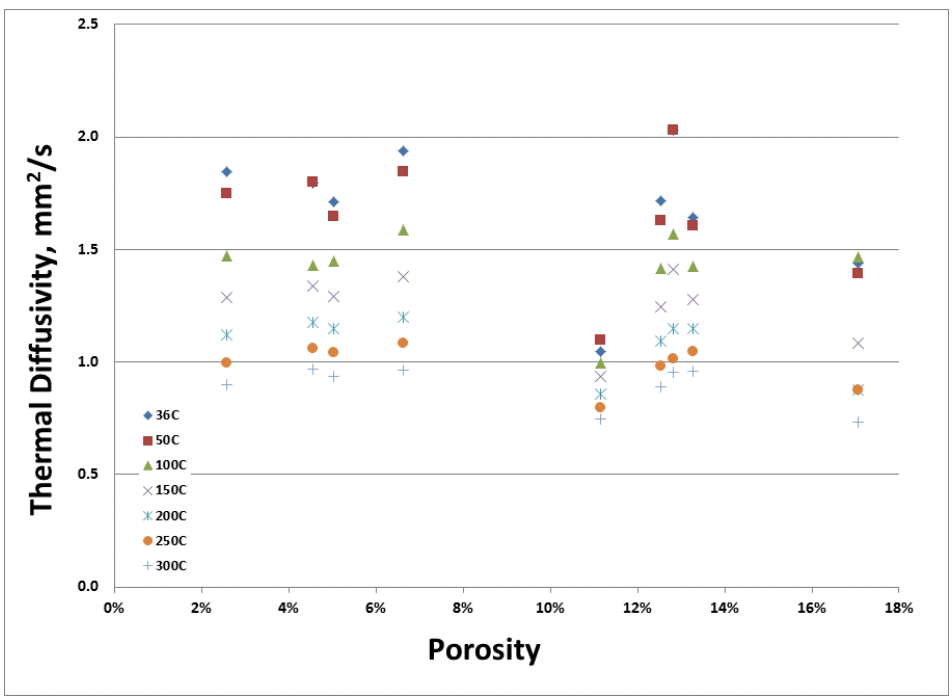

Figure 30. Thermal Diffusivity versus porosity

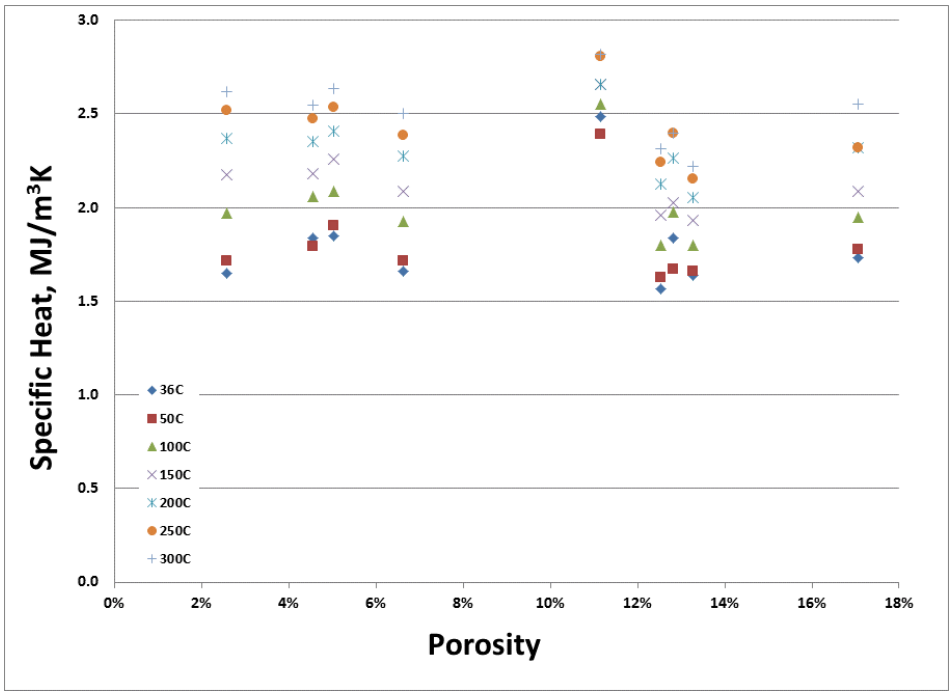

Figure 31. Specific Heat versus porosity

4. DISCUSSION OF RESULTS

The prime focus of this study has been to make measurements of thermophysical properties of crushed salt as it is reconsolidated as a function of porosity, with an emphasis on thermal conductivity.

In this engagement, it was recognized the crushed bedded salt used may dewater; this dewatering was quantified. A maximum water loss of less than 0.5% by weight was measured for the temperature range studied. The thermal properties measured do not appear to be impacted by the presence or lack of water. In a repository setting, if water is liberated by heating, its presence may have to be addressed within transport, corrosion, mechanical response scenarios.

The mixture theory model (equation 1) was used to predict crushed salt bulk thermal properties from those of component thermal properties. Estimating single-crystal thermal properties provided a component for the mixture model and it a data set to compare with published literature (Birch and Clark (1940a,b), Figure 32). For the temperature range from -75°C to 300°C, halite single crystal thermal conductivity decreases by a factor of 4, from ~10W/mK to ~2.5W/mK. The new data and that from the literature together represent a temperature range of 475 ^{o}C.

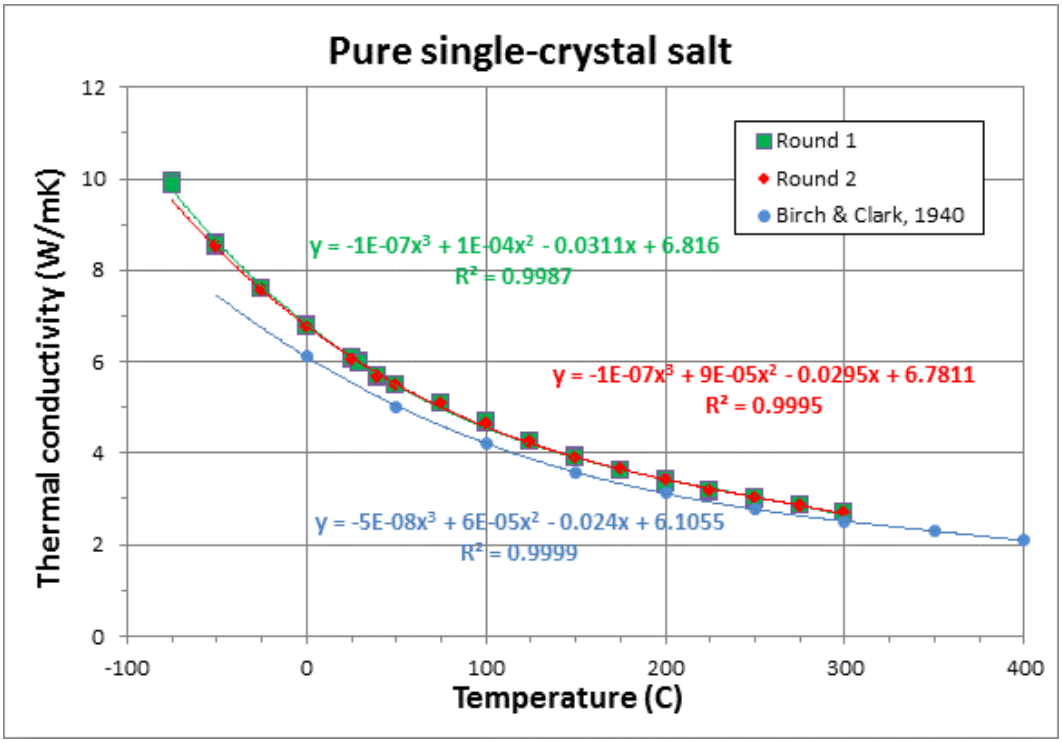

Figure 32. Measured thermal conductivity of single crystal halite, this work and Birch and Clark (1940a, b).

During the course of this study, nearly two thousand thermal conductivity measurements were made over a range of porosities and temperatures. Thermal conductivity of porous salt was found to decrease with increasing porosity, and decrease with increasing temperature.

Using the single crystal data and a generalized mixture theory equation, the geometric mean of rock conductivity and pore conductivity were used to model the bulk thermal conductivity of a two-medium material (equation 1). Using values for salt (rock) and air (pore fluid) at different temperatures from (Table 1) creates an estimate of the range of values (Figure 33) likely to be encountered in a compacting crush salt environment. Here all data are represented, with calculated values (the curves) shown for 25°, 100°, 150°, and 200°C. The data are well represented by the simple model.

In such an environment then, as the crushed salt compacts, the thermal conductivity will increase, thus dissipating the heat in a more efficient manner as time progresses.

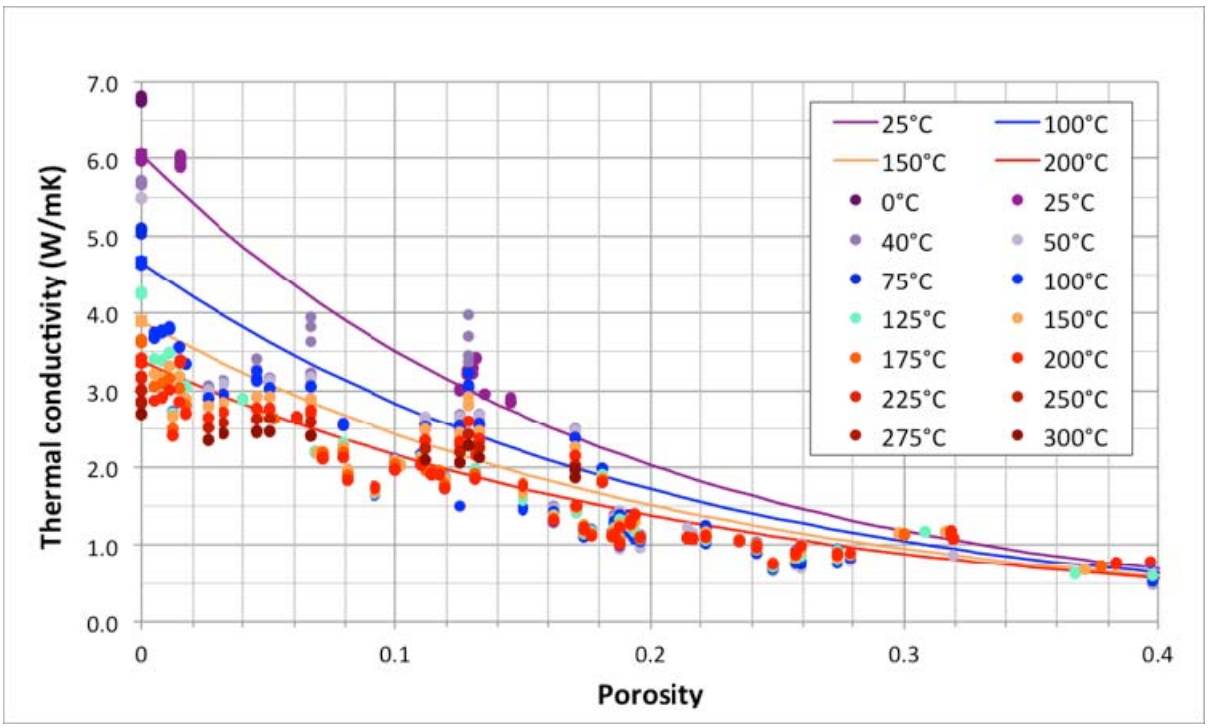

Figure 33. Estimated thermal conductivity of porous salt. Solid lines represent values predicted by Equation 1; points represent measured data.

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APPENDIX 1
Holometrix Data

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
100C_Crushed_12	99.6	1.90897	11.7%
100C_Crushed_19	99.6	1.09637	19.4%
100C_Crushed_19	99.7	1.07939	19.4%
100C_Crushed_12	99.7	1.92021	11.7%
100C_Crushed_12	99.7	1.92459	11.7%
100C_Crushed_15	100.0	1.50346	15.0%
100C_Crushed_15	100.0	1.49007	15.0%
100C_WIPP2_1	100.0	3.55104	1.5%
100C_WIPP2_1	100.0	3.55901	1.5%
100C_WIPP2_1	100.0	3.56273	1.5%
100C_Crushed_15	100.0	1.47953	15.0%
100C_WIPP2_1	100.0	3.55574	1.5%
100C_WIPP2_1	100.0	3.55449	1.5%
100C_Crushed_15	100.0	1.46482	15.0%
100C_Crushed_15	100.1	1.44075	15.0%
100C_Crushed_11_ThermTest2	100.1	2.16735	11.0%
100C_Crushed_11_ThermTest2	100.1	2.15751	11.0%
100C_Crushed_11_ThermTest2	100.2	2.16245	11.0%
100C_Crushed_11_ThermTest2	100.2	2.16328	11.0%
100C_Crushed_18	100.2	1.98641	18.1%
100C_Crushed_11_ThermTest2	100.2	2.16441	11.0%
100C_Crushed_18	100.2	1.98557	18.1%
100C_WIPP_1	100.2	3.75701	0.5%
100C_Crushed_18	100.2	1.97778	18.1%
100C_WIPP_1	100.2	3.67320	0.5%
100C_Crushed_18	100.2	1.98114	18.1%
100C_WIPP_1	100.2	3.70488	0.5%
100C_WIPP_1	100.2	3.67411	0.5%
100C_Crushed_17	100.2	1.44328	17.1%
100C_WIPP_1	100.2	3.67889	0.5%
100C_Crushed_18	100.2	1.98196	18.1%
100C_Crushed_17	100.2	1.43749	17.1%
100C_Crushed_17	100.3	1.42842	17.1%
100C_Crushed_17	100.3	1.42874	17.1%
100C_Crushed_17	100.4	1.42072	17.1%
100C_Crushed_12_ThermTest5	100.4	1.86789	11.9%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
100C_Crushed_10	100.4	2.10666	10.0%
100C_Crushed_10	100.4	2.10136	10.0%
100C_Crushed_10	100.5	2.10341	10.0%
100C_Crushed_10	100.5	2.10472	10.0%
100C_Crushed_10	100.5	2.09872	10.0%
100C_Crushed_12_ThermTest5	100.5	1.87027	11.9%
100C_Crushed_12_ThermTest5	100.5	1.87616	11.9%
100C_Crushed_12_ThermTest5	100.5	1.87704	11.9%
100C_Crushed_12_ThermTest5	100.5	1.87726	11.9%
100C_Crushed_19	100.5	1.10882	19.4%
100C_Crushed_19	100.6	1.11207	19.4%
100C_Crushed_13	100.6	1.96929	13.1%
100C_Crushed_19	100.6	1.10329	19.4%
100C_Crushed_13	100.6	1.96898	13.1%
100C_Crushed_13	100.6	1.96924	13.1%
100C_Crushed_12	100.6	1.91222	11.7%
100C_Crushed_13	100.6	1.97260	13.1%
100C_Crushed_13	100.7	1.97327	13.1%
100C_Crushed_12	100.7	1.92007	11.7%
125C_Crushed_18	124.7	1.90797	18.1%
125C_Crushed_18	124.7	1.90933	18.1%
125C_Crushed_18	124.7	1.89904	18.1%
125C_Crushed_18	124.7	1.90541	18.1%
125C_Crushed_12_ThermTest5	124.8	1.86309	11.9%
125C_Crushed_12_ThermTest5	124.9	1.86421	11.9%
125C_Crushed_12_ThermTest5	124.9	1.86340	11.9%
125C_Crushed_10	124.9	2.04035	10.0%
125C_Crushed_10	124.9	2.04211	10.0%
125C_Crushed_12_ThermTest5	124.9	1.85859	11.9%
125C_Crushed_13	124.9	1.96601	13.1%
125C_Crushed_13	124.9	1.96610	13.1%
125C_Crushed_13	124.9	1.96168	13.1%
125C_Crushed_19	124.9	1.18223	19.4%
125C_Crushed_12_ThermTest5	124.9	1.85481	11.9%
125C_Crushed_13	124.9	1.95962	13.1%
125C_Crushed_10	124.9	2.04784	10.0%
125C_Crushed_19	124.9	1.17780	19.4%
125C_Crushed_10	124.9	2.04571	10.0%
125C_Crushed_13	124.9	1.95935	13.1%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
125C_Crushed_10	125.0	2.04814	10.0%
125C_Crushed_19	125.0	1.17457	19.4%
125C_Crushed_12	125.0	1.91007	11.7%
125C_Crushed_12	125.0	1.90804	11.7%
125C_Crushed_19	125.0	1.17025	19.4%
125C_Crushed_19	125.0	1.16813	19.4%
125C_Crushed_12	125.0	1.90803	11.7%
125C_Crushed_12	125.0	1.90450	11.7%
125C_Crushed_12	125.1	1.89978	11.7%
125C_Crushed_15	125.2	1.60578	15.0%
125C_Crushed_15	125.2	1.59994	15.0%
125C_WIPP2_1	125.2	3.34683	1.5%
125C_Crushed_15	125.2	1.59260	15.0%
125C_WIPP2_1	125.3	3.35236	1.5%
125C_WIPP2_1	125.3	3.35038	1.5%
125C_Crushed_15	125.3	1.58692	15.0%
125C_WIPP2_1	125.3	3.34226	1.5%
125C_WIPP2_1	125.3	3.34182	1.5%
125C_Crushed_15	125.3	1.57437	15.0%
125C_WIPP_1	125.4	3.41162	0.5%
125C_WIPP_1	125.4	3.40811	0.5%
125C_WIPP_1	125.5	3.40421	0.5%
125C_WIPP_1	125.5	3.40677	0.5%
125C_Crushed_11_ThermTest2	125.5	2.13499	11.0%
125C_WIPP_1	125.5	3.40876	0.5%
125C_Crushed_11_ThermTest2	125.5	2.13526	11.0%
125C_Crushed_11_ThermTest2	125.5	2.13393	11.0%
125C_Crushed_11_ThermTest2	125.5	2.13016	11.0%
125C_Crushed_11_ThermTest2	125.6	2.12814	11.0%
125C_Crushed_17	125.6	1.42134	17.1%
125C_Crushed_17	125.6	1.42676	17.1%
125C_Crushed_17	125.7	1.43437	17.1%
125C_Crushed_18	125.7	1.90074	18.1%
125C_Crushed_17	125.7	1.43713	17.1%
125C_Crushed_17	125.7	1.43943	17.1%
150C_Crushed_17	150.1	1.47938	17.1%
150C_Crushed_17	150.2	1.47664	17.1%
150C_Crushed_17	150.2	1.47259	17.1%
150C_Crushed_10	150.2	2.09556	10.0%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
150C_Crushed_10	150.2	2.09154	10.0%
150C_Crushed_18	150.2	1.85200	18.1%
150C_Crushed_18	150.2	1.85662	18.1%
150C_Crushed_18	150.2	1.86122	18.1%
150C_Crushed_10	150.2	2.08574	10.0%
150C_Crushed_18	150.2	1.85675	18.1%
150C_Crushed_19	150.2	1.29973	19.4%
150C_Crushed_17	150.2	1.46768	17.1%
150C_Crushed_19	150.2	1.30064	19.4%
150C_Crushed_18	150.2	1.85278	18.1%
150C_Crushed_17	150.2	1.47020	17.1%
150C_Crushed_10	150.2	2.08446	10.0%
150C_Crushed_19	150.2	1.29298	19.4%
150C_Crushed_10	150.3	2.08409	10.0%
150C_Crushed_19	150.3	1.30942	19.4%
150C_Crushed_19	150.3	1.30489	19.4%
150C_Crushed_12_ThermTest5	150.4	1.84118	11.9%
150C_Crushed_12_ThermTest5	150.4	1.84162	11.9%
150C_Crushed_12_ThermTest5	150.4	1.84330	11.9%
150C_Crushed_13	150.5	1.91749	13.1%
150C_Crushed_12	150.5	1.94467	11.7%
150C_Crushed_13	150.5	1.91797	13.1%
150C_Crushed_12_ThermTest5	150.5	1.84263	11.9%
150C_Crushed_13	150.5	1.92086	13.1%
150C_Crushed_12	150.5	1.94096	11.7%
150C_Crushed_12	150.5	1.93882	11.7%
150C_Crushed_12_ThermTest5	150.5	1.84114	11.9%
150C_Crushed_12	150.5	1.94085	11.7%
150C_Crushed_13	150.5	1.92046	13.1%
150C_Crushed_13	150.5	1.92089	13.1%
150C_Crushed_12	150.6	1.93832	11.7%
150C_Crushed_15	150.6	1.67268	15.0%
150C_WIPP2_1	150.6	3.18357	1.5%
150C_Crushed_15	150.6	1.67660	15.0%
150C_Crushed_15	150.6	1.67890	15.0%
150C_WIPP2_1	150.6	3.18737	1.5%
150C_WIPP2_1	150.6	3.18419	1.5%
150C_WIPP2_1	150.6	3.18161	1.5%
150C_Crushed_15	150.6	1.66070	15.0%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
150C_WIPP2_1	150.6	3.18429	1.5%
150C_Crushed_15	150.6	1.68001	15.0%
150C_WIPP_1	150.8	3.21694	0.5%
150C_WIPP_1	150.8	3.21508	0.5%
150C_WIPP_1	150.8	3.21501	0.5%
150C_WIPP_1	150.9	3.21898	0.5%
150C_WIPP_1	150.9	3.21946	0.5%
150C_Crushed_11_ThermTest2	151.8	2.10941	11.0%
150C_Crushed_11_ThermTest2	151.8	2.11005	11.0%
150C_Crushed_11_ThermTest2	151.8	2.11412	11.0%
150C_Crushed_11_ThermTest2	151.9	2.10958	11.0%
150C_Crushed_11_ThermTest2	151.9	2.11315	11.0%
175C_WIPP2_1_Try1	174.3	3.03122	1.5%
175C_WIPP2_1_Try1	174.3	3.03151	1.5%
175C_WIPP2_1_Try1	174.3	3.03324	1.5%
175C_WIPP2_1_Try1	174.3	3.03069	1.5%
175C_WIPP2_1_Try2	174.3	3.01721	1.5%
175C_WIPP2_1_Try1	174.4	3.03289	1.5%
175C_WIPP2_1_Try2	174.4	3.01712	1.5%
175C_WIPP2_1_Try2	174.4	3.01668	1.5%
175C_WIPP2_1_Try2	174.4	3.01606	1.5%
175C_WIPP2_1_Try2	174.5	3.01999	1.5%
175C_WIPP_1	174.6	3.05688	0.5%
175C_WIPP_1	174.6	3.05139	0.5%
175C_WIPP_1	174.7	3.05414	0.5%
175C_WIPP_1	174.7	3.05411	0.5%
175C_WIPP_1	174.7	3.05504	0.5%
175C_Crushed_11_ThermTest2	175.5	2.06524	11.0%
175C_Crushed_11_ThermTest2	175.5	2.07062	11.0%
175C_Crushed_11_ThermTest2	175.5	2.07393	11.0%
175C_Crushed_11_ThermTest2	175.5	2.06766	11.0%
175C_Crushed_11_ThermTest2	175.5	2.06424	11.0%
175C_Crushed_18	175.7	1.83713	18.1%
175C_Crushed_18	175.7	1.83679	18.1%
175C_Crushed_18	175.7	1.83750	18.1%
175C_Crushed_18	175.7	1.83804	18.1%
175C_Crushed_18	175.7	1.83884	18.1%
175C_Crushed_10	175.7	2.03637	10.0%
175C_Crushed_10	175.7	2.03602	10.0%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
175C_Crushed_10	175.7	2.03693	10.0%
175C_Crushed_10	175.7	2.03553	10.0%
175C_Crushed_12	175.7	1.95071	11.7%
175C_Crushed_12	175.8	1.95249	11.7%
175C_Crushed_12	175.8	1.94975	11.7%
175C_Crushed_10	175.8	2.03746	10.0%
175C_Crushed_12	175.8	1.95240	11.7%
175C_Crushed_12	175.8	1.95006	11.7%
175C_Crushed_15	175.8	1.78924	15.0%
175C_Crushed_15	175.9	1.78969	15.0%
175C_Crushed_15	175.9	1.79008	15.0%
175C_Crushed_15	175.9	1.78615	15.0%
175C_Crushed_15	175.9	1.78347	15.0%
175C_Crushed_13	175.9	1.91034	13.1%
175C_Crushed_13	175.9	1.91264	13.1%
175C_Crushed_13	175.9	1.91058	13.1%
175C_Crushed_13	175.9	1.91455	13.1%
175C_Crushed_13	175.9	1.91337	13.1%
175C_Crushed_12_ThermTest5	176.2	1.77879	11.9%
175C_Crushed_12_ThermTest5	176.2	1.77983	11.9%
175C_Crushed_12_ThermTest5	176.2	1.77787	11.9%
175C_Crushed_12_ThermTest5	176.2	1.77502	11.9%
175C_Crushed_12_ThermTest5	176.3	1.77673	11.9%
175C_Crushed_17	176.4	1.50264	17.1%
175C_Crushed_17	176.4	1.49879	17.1%
175C_Crushed_17	176.4	1.50455	17.1%
175C_Crushed_17	176.4	1.50196	17.1%
175C_Crushed_17	176.4	1.50504	17.1%
175C_Crushed_19	176.6	1.38266	19.4%
175C_Crushed_19	176.6	1.37810	19.4%
175C_Crushed_19	176.6	1.38292	19.4%
175C_Crushed_19	176.6	1.38196	19.4%
175C_Crushed_19	176.6	1.37891	19.4%
200C_WIPP2_1	198.6	2.85640	1.5%
200C_WIPP2_1	198.7	2.85147	1.5%
200C_WIPP2_1	198.7	2.85084	1.5%
200C_WIPP2_1	198.7	2.85325	1.5%
200C_WIPP2_1	198.7	2.85765	1.5%
200C_WIPP_1	199.0	2.86861	0.5%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
200C_WIPP_1	199.0	2.87422	0.5%
200C_WIPP_1	199.0	2.87361	0.5%
200C_WIPP_1	199.0	2.87514	0.5%
200C_WIPP_1	199.0	2.87241	0.5%
200C_Crushed_11_ThermTest2	199.9	2.02969	11.0%
200C_Crushed_11_ThermTest2	199.9	2.03204	11.0%
200C_Crushed_11_ThermTest2	199.9	2.02827	11.0%
200C_Crushed_11_ThermTest2	199.9	2.03445	11.0%
200C_Crushed_11_ThermTest2	200.0	2.02489	11.0%
200C_Crushed_15	200.2	1.75732	15.0%
200C_Crushed_10	200.2	1.96894	10.0%
200C_Crushed_10	200.2	1.96676	10.0%
200C_Crushed_15	200.2	1.75982	15.0%
200C_Crushed_10	200.2	1.96489	10.0%
200C_Crushed_15	200.2	1.76350	15.0%
200C_Crushed_15	200.2	1.76081	15.0%
200C_Crushed_15	200.2	1.75883	15.0%
200C_Crushed_12	200.2	1.89785	11.7%
200C_Crushed_10	200.2	1.96652	10.0%
200C_Crushed_10	200.2	1.97111	10.0%
200C_Crushed_12	200.2	1.89806	11.7%
200C_Crushed_12	200.3	1.89718	11.7%
200C_Crushed_12	200.3	1.90020	11.7%
200C_Crushed_12	200.3	1.90045	11.7%
200C_Crushed_13	200.3	1.85853	13.1%
200C_Crushed_13	200.3	1.85304	13.1%
200C_Crushed_13	200.3	1.85241	13.1%
200C_Crushed_13	200.3	1.85690	13.1%
200C_Crushed_13	200.3	1.85233	13.1%
200C_Crushed_18	200.3	1.80268	18.1%
200C_Crushed_18	200.3	1.80577	18.1%
200C_Crushed_18	200.3	1.80248	18.1%
200C_Crushed_18	200.4	1.80424	18.1%
200C_Crushed_18	200.4	1.80401	18.1%
200C_Crushed_12_ThermTest5	200.5	1.73105	11.9%
200C_Crushed_12_ThermTest5	200.5	1.72965	11.9%
200C_Crushed_12_ThermTest5	200.5	1.72824	11.9%
200C_Crushed_12_ThermTest5	200.5	1.73125	11.9%
200C_Crushed_12_ThermTest5	200.5	1.73158	11.9%

NEW CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
200C_Crushed_19	200.8	1.39658	19.4%
200C_Crushed_19	200.8	1.40149	19.4%
200C_Crushed_19	200.8	1.38947	19.4%
200C_Crushed_19	200.8	1.39562	19.4%
200C_Crushed_19	200.9	1.39818	19.4%
200C_Crushed_17	200.9	1.50323	17.1%
200C_Crushed_17	200.9	1.50232	17.1%
200C_Crushed_17	200.9	1.50103	17.1%
200C_Crushed_17	200.9	1.50302	17.1%
200C_Crushed_17	200.9	1.49661	17.1%

NEW CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
100C_Native_11mm_1	99.7	3.74321	0.8%
100C_Native_11mm_1	99.7	3.76597	0.8%
100C_Native_11mm_1	99.8	3.75519	0.8%
100C_Native_11mm_1	99.8	3.76820	0.8%
100C_Native_11mm_1	99.8	3.77788	0.8%
100C_Solar1	99.9	2.57904	7.9%
100C_Solar1	99.9	2.54832	7.9%
100C_Solar1	99.9	2.53774	7.9%
100C_Solar1	99.9	2.55678	7.9%
100C_Solar1	99.9	2.54132	7.9%
100C_Native1	100.1	3.79506	1.1%
100C_Native1	100.1	3.79445	1.1%
100C_Native1	100.2	3.77952	1.1%
100C_Native1	100.2	3.80195	1.1%
100C_Native1	100.2	3.82477	1.1%
100C_Native_8mm_1	100.4	2.71950	1.2%
100C_Native_8mm_1	100.4	2.70168	1.2%
100C_Native_8mm_1	100.4	2.70105	1.2%
100C_Native_8mm_1	100.4	2.73648	1.2%
100C_Solar_5mm_9	100.5	1.65927	9.2%
100C_Native_8mm_1	100.5	2.72596	1.2%
100C_Solar_5mm_9	100.5	1.66870	9.2%
100C_Solar_5mm_9	100.5	1.64671	9.2%
100C_Solar_5mm_9	100.5	1.67238	9.2%
100C_Solar_14mm_8	100.5	1.90670	8.1%
100C_Solar_14mm_8	100.5	1.90928	8.1%
100C_Solar_14mm_8	100.5	1.90644	8.1%
100C_Solar_14mm_8	100.5	1.91111	8.1%
100C_Solar_5mm_9	100.5	1.67467	9.2%
100C_Solar_14mm_8	100.5	1.91136	8.1%
100C_Native2_8mm_2	101.9	3.34390	1.7%
100C_Native2_8mm_2	101.9	3.33477	1.7%
100C_Native2_8mm_2	101.9	3.33368	1.7%
100C_Native2_8mm_2	101.9	3.34319	1.7%
100C_Native2_8mm_2	102.0	3.35526	1.7%
125C_Solar_11mm_8	124.7	1.96657	8.1%
125C_Solar_11mm_8	124.7	1.96712	8.1%
125C_Solar_11mm_8	124.7	1.96451	8.1%

NEW CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
125C_Solar_11mm_8	124.7	1.96608	8.1%
125C_Solar_11mm_8	124.7	1.96802	8.1%
125C_Solar1	125.4	2.32033	7.9%
125C_Solar1	125.4	2.31340	7.9%
125C_Solar1	125.4	2.31420	7.9%
125C_Solar1	125.5	2.31198	7.9%
125C_Native1	125.5	3.48275	1.1%
125C_Solar1	125.5	2.30428	7.9%
125C_Native1	125.5	3.48931	1.1%
125C_Native1	125.5	3.47915	1.1%
125C_Native1	125.5	3.49013	1.1%
125C_Native1	125.5	3.47909	1.1%
125C_Native2_8mm_2	126.1	3.05637	1.7%
125C_Native2_8mm_2	126.1	3.06085	1.7%
125C_Native2_8mm_2	126.1	3.05396	1.7%
125C_Native2_8mm_2	126.2	3.05404	1.7%
125C_Native2_8mm_2	126.2	3.05475	1.7%
125C_Native_8m_1	126.5	2.70483	1.2%
125C_Native_8m_1	126.5	2.71127	1.2%
125C_Native_8m_1	126.5	2.70729	1.2%
125C_Native_8m_1	126.5	2.71037	1.2%
125C_Native_8m_1	126.5	2.70684	1.2%
125C_Solar_5mm_9	126.5	1.67324	9.2%
125C_Solar_5mm_9	126.6	1.67307	9.2%
125C_Solar_5mm_9	126.6	1.67534	9.2%
125C_Solar_5mm_9	126.6	1.67828	9.2%
125C_Solar_5mm_9	126.6	1.67966	9.2%
125C_Native_11mm_1	126.9	3.39226	0.8%
125C_Native_11mm_1	126.9	3.39206	0.8%
125C_Native_11mm_1	126.9	3.38185	0.8%
125C_Native_11mm_1	126.9	3.38859	0.8%
125C_Native_11mm_1	126.9	3.38645	0.8%
150C_Native2_8mm_2	149.4	2.89580	1.7%
150C_Native2_8mm_2	149.4	2.89719	1.7%
150C_Native2_8mm_2	149.4	2.89895	1.7%
150C_Native2_8mm_2	149.4	2.89772	1.7%
150C_Native2_8mm_2	149.4	2.89034	1.7%
150C_Native_8mm_1	149.6	2.67170	1.2%
150C_Native_8mm_1	149.6	2.66764	1.2%

NEW CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
150C_Native_8mm_1	149.7	2.66829	1.2%
150C_Solar_5mm_9	149.7	1.69512	9.2%
150C_Native_8mm_1	149.7	2.66434	1.2%
150C_Solar_5mm_9	149.7	1.69106	9.2%
150C_Native_8mm_1	149.7	2.67017	1.2%
150C_Solar_5mm_9	149.7	1.69497	9.2%
150C_Solar_5mm_9	149.7	1.69107	9.2%
150C_Solar_5mm_9	149.7	1.68833	9.2%
150C_Native_11mm_1	150.1	3.17443	0.8%
150C_Native_11mm_1	150.1	3.17425	0.8%
150C_Native_11mm_1	150.1	3.17296	0.8%
150C_Native_11mm_1	150.1	3.17070	0.8%
150C_Native_11mm_1	150.1	3.17022	0.8%
150C_Solar_11mm_8	150.7	1.97313	8.1%
150C_Solar_11mm_8	150.8	1.97649	8.1%
150C_Native1	150.8	3.31030	1.1%
150C_Native1	150.8	3.31300	1.1%
150C_Native1	150.8	3.31614	1.1%
150C_Solar_11mm_8	150.8	1.97220	8.1%
150C_Native1	150.8	3.31632	1.1%
150C_Native1	150.8	3.31750	1.1%
150C_Solar_11mm_8	150.9	1.97724	8.1%
150C_Solar_11mm_8	150.9	1.97606	8.1%
150C_Solar1	151.7	2.25673	7.9%
150C_Solar1	151.7	2.25888	7.9%
150C_Solar1	151.7	2.25747	7.9%
150C_Solar1	151.7	2.25646	7.9%
150C_Solar1	151.7	2.25807	7.9%
175C_Solar_5mm_9	173.2	1.75367	9.2%
175C_Solar_5mm_9	173.2	1.75592	9.2%
175C_Solar_5mm_9	173.2	1.75488	9.2%
175C_Solar_5mm_9	173.2	1.75280	9.2%
175C_Solar_5mm_9	173.2	1.75093	9.2%
175C_Native_8mm_1	173.4	2.49794	1.2%
175C_Native_8mm_1	173.5	2.49655	1.2%
175C_Native_8mm_1	173.5	2.50184	1.2%
175C_Native_8mm_1	173.5	2.49354	1.2%
175C_Native_8mm_1	173.5	2.49911	1.2%
175C_Native_11mm_1	173.5	3.09106	0.8%

NEW CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
175C_Native_11mm_1	173.5	3.09334	0.8%
175C_Native_11mm_1	173.6	3.09156	0.8%
175C_Native_11mm_1	173.6	3.09154	0.8%
175C_Native_11mm_1	173.6	3.09414	0.8%
175C_Solar_11mm_8	174.5	1.89807	8.1%
175C_Solar_11mm_8	174.5	1.89379	8.1%
175C_Solar_11mm_8	174.5	1.89400	8.1%
175C_Native1	174.5	3.15394	1.1%
175C_Native1	174.6	3.15170	1.1%
175C_Solar_11mm_8	174.6	1.89525	8.1%
175C_Native1	174.6	3.14443	1.1%
175C_Native1	174.6	3.15622	1.1%
175C_Native1	174.6	3.15190	1.1%
175C_Solar_11mm_8	174.6	1.89266	8.1%
175C_Native2_8mm_2	174.8	2.81423	1.7%
175C_Native2_8mm_2	174.8	2.80905	1.7%
175C_Native2_8mm_2	174.8	2.81413	1.7%
175C_Native2_8mm_2	174.8	2.80705	1.7%
175C_Native2_8mm_2	174.8	2.80841	1.7%
175C_Solar1	175.2	2.19640	7.9%
175C_Solar1	175.3	2.19414	7.9%
175C_Solar1	175.3	2.19427	7.9%
175C_Solar1	175.3	2.19621	7.9%
175C_Solar1	175.3	2.19326	7.9%
200C_Native2_8mm_2	198.1	2.71429	1.7%
200C_Native2_8mm_2	198.1	2.70995	1.7%
200C_Native2_8mm_2	198.1	2.70682	1.7%
200C_Solar_5mm_9	198.1	1.74967	9.2%
200C_Solar_5mm_9	198.1	1.74620	9.2%
200C_Native2_8mm_2	198.2	2.70089	1.7%
200C_Solar_5mm_9	198.2	1.72701	9.2%
200C_Solar_5mm_9	198.2	1.73920	9.2%
200C_Native2_8mm_2	198.2	2.69352	1.7%
200C_Solar_5mm_9	198.2	1.73478	9.2%
200C_Native_11mm_1	198.3	2.91716	0.8%
200C_Native_11mm_1	198.3	2.91102	0.8%
200C_Native_11mm_1	198.3	2.91737	0.8%
200C_Native_11mm_1	198.4	2.91278	0.8%
200C_Native_8mm_1	198.4	2.40673	1.2%

NEW CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
200C_Native_8mm_1	198.5	2.41618	1.2%
200C_Native_8mm_1	198.5	2.41489	1.2%
200C_Native_8mm_1	198.5	2.41198	1.2%
200C_Native_8mm_1	198.6	2.41452	1.2%
200C_Solar_11mm_8	198.7	1.83071	8.1%
200C_Solar_11mm_8	198.7	1.83177	8.1%
200C_Solar_11mm_8	198.8	1.83088	8.1%
200C_Solar_11mm_8	198.8	1.82951	8.1%
200C_Native1	198.8	3.00918	1.1%
200C_Solar_11mm_8	198.8	1.82994	8.1%
200C_Native1	198.8	3.01109	1.1%
200C_Native1	198.8	3.00386	1.1%
200C_Native1	198.8	3.00718	1.1%
200C_Native1	198.8	3.00974	1.1%
200C_Native_11mm_1	199.3	2.89860	0.8%
200C_Solar1	199.8	2.12273	7.9%
200C_Solar1	199.8	2.12374	7.9%
200C_Solar1	199.8	2.12332	7.9%
200C_Solar1	199.8	2.12853	7.9%
200C_Solar1	199.8	2.12873	7.9%

THERMTEST REPORT (high porosity = Crushed salt; low porosity = Domal and Solar salt)			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
ThermTest1	22	3.23300	12.8%
ThermTest1	22	3.20700	12.8%
ThermTest1	22	3.27200	12.8%
ThermTest1	22	3.24100	12.8%
ThermTest1	22	3.19900	12.8%
ThermTest2	22	3.40900	13.2%
ThermTest2	22	3.41900	13.2%
ThermTest2	22	3.41800	13.2%
ThermTest2	22	3.41000	13.2%
ThermTest2	22	3.42600	13.2%
ThermTest1 & 2	22	3.28500	13.0%
ThermTest1 & 2	22	3.21300	13.0%
ThermTest1 & 2	22	3.28900	13.0%
ThermTest1 & 2	22	3.29900	13.0%
ThermTest1 & 2	22	3.28000	13.0%
ThermTest3	22	2.91800	14.5%
ThermTest3	22	2.86000	14.5%
ThermTest3	22	2.85900	14.5%
ThermTest3	22	2.85300	14.5%
ThermTest3	22	2.84900	14.5%
ThermTest4	22	3.01200	12.5%
ThermTest4	22	2.99600	12.5%
ThermTest4	22	3.02100	12.5%
ThermTest4	22	3.01700	12.5%
ThermTest4	22	3.01400	12.5%
ThermTest3 & 4	22	2.95300	13.5%
ThermTest3 & 4	22	2.95000	13.5%
ThermTest3 & 4	22	2.95500	13.5%
ThermTest3 & 4	22	2.95400	13.5%
ThermTest3 & 4	22	2.95400	13.5%
ThermTest6	22	6.04100	1.5%
ThermTest6	22	5.97500	1.5%
ThermTest6	22	5.96800	1.5%
ThermTest6	22	6.03700	1.5%
ThermTest6	22	6.02000	1.5%
ThermTest7	22	6.03900	1.5%
ThermTest7	22	6.00800	1.5%

THERMTEST REPORT (high porosity = Crushed salt; low porosity = Domal and Solar salt)			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
ThermTest7	22	5.93400	1.5%
ThermTest7	22	6.01100	1.5%
ThermTest7	22	6.02100	1.5%
ThermTest6 & 7	22	5.89000	1.5%
ThermTest6 & 7	22	5.89600	1.5%
ThermTest6 & 7	22	5.90900	1.5%
ThermTest6 & 7	22	5.90300	1.5%
ThermTest6 & 7	22	5.88600	1.5%
ThermTest2	200	2.16700	13.2%
ThermTest2	200	2.16000	13.2%
ThermTest2	200	2.16600	13.2%
ThermTest2	200	2.15500	13.2%
ThermTest2	200	2.15400	13.2%
ThermTest6	200	3.35400	1.5%
ThermTest6	200	3.37900	1.5%
ThermTest6	200	3.37900	1.5%
ThermTest6	200	3.39400	1.5%
ThermTest6	200	3.39700	1.5%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120308_2	39.4	1.38992	18.6%
WIPP_mixed_120301	39.6	0.58599	40.2%
WIPP_1mm_120224	39.6	0.52286	43.0%
WIPPpacked_mixed_120307	39.6	1.29749	16.2%
WIPPpacked_mixed_120308_2	39.7	1.15110	18.6%
WIPP_sub600um_120223	40.1	0.48289	39.8%
WIPP_600um_120222	40.3	0.58284	46.4%
WIPPpacked_mixed_120307	40.3	1.49570	16.2%
WIPPpacked_mixed_120411	49.5	1.22829	21.5%
WIPPpacked_mixed_120412	49.6	1.16137	21.7%
WIPP_1mm_120224	49.6	0.53094	43.0%
WIPP_mixed_120301	49.6	0.58996	40.2%
WIPPpacked_mixed_120307	49.6	1.28928	16.2%
WIPPpacked_mixed_120309	49.7	0.95625	18.8%
WIPPwetted_mixed_120305	49.7	0.71888	39.7%
WIPPpacked_mixed_120406	49.8	0.88280	24.2%
WIPPpacked_mixed_120308_2	49.8	1.14929	18.6%
WIPPpacked_mixed_120417	49.8	0.86966	31.9%
WIPPpacked_mixed_120322	49.9	1.21740	17.7%
WIPP_sub600um_120223	49.9	0.49936	39.8%
WIPPpacked_mixed_120328	50.0	0.69146	25.9%
WIPPpacked_mixed_120321	50.0	1.16631	18.5%
WIPPpacked_mixed_120308	50.0	1.21184	18.8%
WIPPpacked_mixed_120329	50.1	0.72842	25.7%
WIPPpacked_mixed_120308	50.2	1.45293	18.8%
WIPPpacked_120306	50.2	0.78320	27.9%
WIPPpacked_mixed_120320	50.2	0.96973	19.6%
WIPPpacked_mixed_120418	50.3	1.13958	30.0%
WIPP_600um_120222	50.3	0.58828	46.4%
WIPPpacked_mixed_120404	50.4	0.64958	24.8%
WIPPpacked_mixed_120326	50.4	1.11982	19.2%
WIPPpacked_mixed_120307	50.4	1.47267	16.2%
WIPPpacked_mixed_120308_2	50.4	1.35503	18.6%
WIPPpacked_mixed_120328	50.5	1.01302	25.9%
WIPPpacked_mixed_120410	50.6	1.06621	23.5%
WIPPpacked_mixed_120404	73.7	0.76470	24.8%
WIPPpacked_mixed_120406	74.4	1.03749	24.2%
WIPPpacked_mixed_120406	74.5	0.89790	24.2%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPP_1mm_120301	74.6	0.51825	43.8%
WIPPpacked_mixed_120329	74.6	0.92574	25.7%
WIPPpacked_mixed_120308_2	74.6	1.17150	18.6%
WIPP_sub600um_120223	74.7	0.52698	39.8%
WIPPpacked_mixed_120328	74.7	0.74400	25.9%
WIPPpacked_mixed_120329	74.8	0.75106	25.7%
WIPPpacked_mixed_120326	74.9	1.39773	19.2%
WIPPpacked_mixed_120308	74.9	1.22532	18.8%
WIPPpacked_mixed_120312	75.0	1.09852	17.4%
WIPPpacked_mixed_120319	75.0	1.25159	22.2%
WIPPpacked_mixed_120308	75.0	1.39504	18.8%
WIPPpacked_mixed_120404	75.1	0.66936	24.8%
WIPPpacked_mixed_120326	75.2	1.15243	19.2%
WIPP_600um_120222	75.2	0.59314	46.4%
WIPPpacked_mixed_120328	75.3	0.99730	25.9%
WIPPpacked_mixed_120309	75.3	1.14133	18.8%
WIPPpacked_mixed_120307	75.3	1.43881	16.2%
WIPP_mixed_120301	75.3	0.75847	40.2%
WIPPpacked_mixed_120308_2	75.3	1.30391	18.6%
WIPPpacked_mixed_120319	75.5	1.02300	22.2%
WIPPpacked_mixed_120309	75.5	0.98851	18.8%
WIPPpacked_mixed_120307	75.5	1.29654	16.2%
WIPP_1mm_120224	75.5	0.54315	43.0%
WIPP_mixed_120301	75.6	0.60133	40.2%
WIPPpacked_mixed_120406	98.1	1.02640	24.2%
WIPPpacked_mixed_120404	98.5	0.75354	24.8%
WIPPpacked_mixed_120406	99.0	1.00294	24.2%
WIPPpacked_mixed_120404	99.5	0.74190	24.8%
WIPPpacked_120306	99.7	0.82805	27.9%
WIPPpacked_mixed_120313	99.7	0.75130	27.4%
WIPPpacked_mixed_120404	99.7	0.68943	24.8%
WIPPpacked_mixed_120326	99.7	1.33989	19.2%
WIPPpacked_mixed_120319	99.7	1.22348	22.2%
WIPPpacked_mixed_120326	99.7	1.19275	19.2%
WIPP_600um_120222	99.8	0.60045	46.4%
WIPPpacked_mixed_120319	99.8	1.20111	22.2%
WIPPpacked_mixed_120328	99.9	0.99060	25.9%
WIPPpacked_mixed_120307	100.0	1.41840	16.2%
WIPPpacked_mixed_120309	100.0	1.11521	18.8%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120309	100.0	1.09589	18.8%
WIPP_mixed_120301	100.0	0.72115	40.2%
WIPPpacked_mixed_120308_2	100.0	1.26662	18.6%
WIPPpacked_mixed_120406	100.0	0.91386	24.2%
WIPP_mixed_120301	100.0	0.74502	40.2%
WIPP_sub600um_120228	100.1	0.62954	42.6%
WIPPpacked_mixed_120319	100.1	1.05154	22.2%
WIPPpacked_mixed_120309	100.1	1.01430	18.8%
WIPPpacked_mixed_120322	100.1	1.20418	17.7%
WIPPpacked_mixed_120329	100.1	0.92142	25.7%
WIPP_sub600um_120223	100.1	0.56062	39.8%
WIPPpacked_mixed_120329	100.2	0.89907	25.7%
WIPPpacked_mixed_120308_2	100.2	1.18566	18.6%
WIPPpacked_mixed_120307	100.2	1.30571	16.2%
WIPPpacked_mixed_120328	100.2	0.80106	25.9%
WIPP_1mm_120224	100.2	0.55638	43.0%
WIPP_1mm_120301	100.2	0.53321	43.8%
WIPPwetted_mixed_120305	100.2	0.75828	39.7%
WIPPpacked_mixed_120312	100.2	1.23994	17.4%
WIPPpacked_mixed_120321	100.2	1.16824	18.5%
WIPPpacked_mixed_120322	100.2	1.17473	17.7%
WIPPpacked_mixed_120312	100.3	1.24210	17.4%
WIPPpacked_mixed_120329	100.3	0.78506	25.7%
WIPPpacked_mixed_120313	100.3	0.95443	27.4%
WIPPpacked_mixed_120321	100.3	1.16131	18.5%
WIPP_mixed_120301	100.3	0.61020	40.2%
WIPPpacked_mixed_120313	100.3	0.93943	27.4%
WIPPpacked_mixed_120312	100.4	1.12604	17.4%
WIPPpacked_mixed_120320	100.4	1.13535	19.6%
WIPPpacked_mixed_120308	100.5	1.35719	18.8%
WIPPpacked_mixed_120308	100.5	1.23505	18.8%
WIPPpacked_mixed_120326	100.5	1.36815	19.2%
WIPPpacked_mixed_120320	100.6	1.04276	19.6%
WIPPpacked_mixed_120404	122.0	0.73666	24.8%
WIPPpacked_mixed_120406	122.4	1.01390	24.2%
WIPPpacked_mixed_120404	123.0	0.74908	24.8%
WIPPpacked_mixed_120406	123.3	1.01325	24.2%
WIPPpacked_mixed_120404	124.0	0.72946	24.8%
WIPPpacked_mixed_120406	124.3	0.99080	24.2%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120322	124.6	1.15339	17.7%
WIPPpellet_1p4mm_125C_120426	124.6	2.04842	10.2%
WIPPpacked_mixed_120313	124.6	0.91478	27.4%
WIPPpellet_1p4mm_125C_120426	124.6	2.04102	10.2%
WIPPpellet_1p4mm_125C_120426	124.6	2.04823	10.2%
WIPPpellet_1p4mm_125C_120426	124.6	2.03816	10.2%
WIPPpacked_mixed_120313	124.6	0.93979	27.4%
WIPPpellet_1p4mm_125C_120426	124.7	2.04599	10.2%
WIPPpellet_1p4mm_125C_120426	124.7	2.04322	10.2%
WIPPpellet_1p4mm_125C_120426	124.7	2.04367	10.2%
WIPPpacked_mixed_120321	124.7	1.14214	18.5%
WIPPpellet_1p4mm_125C_120426	124.7	2.03735	10.2%
WIPPpellet_1p4mm_125C_120426	124.7	2.04375	10.2%
WIPPpellet_1p4mm_125C_120426	124.7	2.04147	10.2%
WIPPpacked_mixed_120312	124.7	1.14761	17.4%
WIPPpacked_mixed_120420	124.7	1.17496	30.8%
WIPPpacked_mixed_120420	124.7	1.17422	30.8%
WIPPpacked_mixed_120420	124.7	1.17388	30.8%
WIPPpacked_mixed_120420	124.7	1.17392	30.8%
WIPPpacked_mixed_120420	124.7	1.17437	30.8%
WIPPpacked_mixed_120420	124.7	1.17341	30.8%
WIPPpacked_mixed_120420	124.7	1.17287	30.8%
WIPPpacked_mixed_120420	124.7	1.17341	30.8%
WIPPpacked_mixed_120420	124.7	1.17545	30.8%
WIPPpacked_mixed_120420	124.7	1.17183	30.8%
WIPPpacked_mixed_120420	124.7	1.17182	30.8%
WIPPpacked_mixed_120420	124.7	1.17409	30.8%
WIPPpacked_mixed_120420	124.7	1.17359	30.8%
WIPPpacked_mixed_120420	124.8	1.17375	30.8%
WIPPpacked_mixed_120420	124.8	1.17091	30.8%
WIPPpacked_mixed_120320	124.8	1.11741	19.6%
WIPPpacked_mixed_120420	124.8	1.17331	30.8%
WIPPpacked_mixed_120420	124.8	1.17489	30.8%
WIPPpacked_mixed_120308	124.8	1.33240	18.8%
WIPPpacked_mixed_120420	124.8	1.17441	30.8%
WIPPpacked_mixed_120308	124.8	1.23800	18.8%
WIPPpacked_mixed_120320	124.8	1.06907	19.6%
WIPPpacked_mixed_120420	124.8	1.17161	30.8%
WIPPpacked_mixed_120420	124.8	1.16515	30.8%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120313	124.8	0.79175	27.4%
WIPPpacked_mixed_120326	124.9	1.35136	19.2%
WIPPpacked_mixed_120326	125.0	1.35148	19.2%
WIPPpacked_mixed_120404	125.0	0.70626	24.8%
WIPPpacked_mixed_120326	125.0	1.22407	19.2%
WIPPpacked_mixed_120326	125.1	1.33254	19.2%
WIPPpacked_mixed_125C_120430	125.1	0.62175	36.7%
WIPPpacked_mixed_125C_120430	125.1	0.62644	36.7%
WIPPpacked_mixed_125C_120430	125.1	0.62691	36.7%
WIPPpacked_mixed_125C_120430	125.1	0.62634	36.7%
WIPPpacked_mixed_125C_120430	125.1	0.62492	36.7%
WIPPpacked_mixed_125C_120430	125.2	0.62921	36.7%
WIPPpacked_mixed_125C_120430	125.2	0.63129	36.7%
WIPPpacked_mixed_120328	125.2	0.99203	25.9%
WIPPpacked_mixed_125C_120430	125.2	0.62973	36.7%
WIPPpacked_mixed_125C_120430	125.2	0.63221	36.7%
WIPPpacked_mixed_125C_120430	125.2	0.63096	36.7%
WIPP_600um_120222	125.2	0.61206	46.4%
WIPPpacked_mixed_125C_120430	125.2	0.63290	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63322	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63648	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63361	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63802	36.7%
WIPPpacked_mixed_120406	125.3	0.92938	24.2%
WIPPpacked_mixed_125C_120430	125.3	0.63625	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63724	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63633	36.7%
WIPPpacked_mixed_120319	125.3	1.16578	22.2%
WIPPpacked_mixed_125C_120430	125.3	0.63482	36.7%
WIPPpacked_mixed_125C_120430	125.3	0.63481	36.7%
WIPPpacked_mixed_120328	125.3	0.85422	25.9%
WIPPpacked_mixed_120309	125.3	1.09585	18.8%
WIPPpacked_mixed_120329	125.3	0.90235	25.7%
WIPP_sub600um_120223	125.4	0.58902	39.8%
WIPPpacked_mixed_120307	125.4	1.39369	16.2%
WIPPpacked_mixed_120322	125.4	1.17767	17.7%
WIPPpacked_mixed_120329	125.4	0.91007	25.7%
WIPPpacked_mixed_120329	125.4	0.88838	25.7%
WIPP_mixed_120301	125.4	0.72572	40.2%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120329	125.4	0.81802	25.7%
WIPPpacked_mixed_120309	125.4	1.08859	18.8%
WIPPpellet_1p4mm_125C_120426	125.4	2.03162	10.2%
WIPPpacked_mixed_120309	125.4	1.07427	18.8%
WIPPpacked_mixed_120309	125.5	1.02492	18.8%
WIPPpacked_mixed_120321	125.5	1.15323	18.5%
WIPPpellet_1p4mm_125C_120426	125.5	2.05200	10.2%
WIPPpellet_1p4mm_125C_120426	125.5	2.03470	10.2%
WIPPpacked_mixed_120307	125.5	1.32415	16.2%
WIPPpacked_mixed_120308_2	125.5	1.22195	18.6%
WIPPpellet_1p4mm_125C_120426	125.5	2.03262	10.2%
WIPPpellet_1p4mm_125C_120426	125.5	2.03920	10.2%
WIPPpacked_mixed_120319	125.5	1.05661	22.2%
WIPP_mixed_120301	125.5	0.70098	40.2%
WIPPpacked_mixed_120312	125.5	1.26572	17.4%
WIPPpacked_mixed_120308_2	125.5	1.17808	18.6%
WIPPpellet_1p4mm_125C_120426	125.5	2.04902	10.2%
WIPPpellet_1p4mm_125C_120426	125.5	2.04967	10.2%
WIPPpacked_mixed_120312	125.6	1.22936	17.4%
WIPPpacked_mixed_120313	125.6	0.92521	27.4%
WIPPpellet_1p4mm_125C_120426	125.6	2.03886	10.2%
WIPPpacked_mixed_120312	125.6	1.26537	17.4%
WIPPpellet_1p4mm_125C_120426	125.6	2.03947	10.2%
WIPP_1mm_120301	125.6	0.54840	43.8%
WIPP_1mm_120224	125.6	0.56649	43.0%
WIPPpellet_1p4mm_125C_120426	125.6	2.03950	10.2%
WIPP_mixed_120301	125.7	0.62367	40.2%
WIPPpacked_mixed_120404	146.9	0.74599	24.8%
WIPPpacked_mixed_120404	148.7	0.77070	24.8%
WIPPpacked_mixed_120404	148.8	0.74766	24.8%
WIPPpacked_mixed_120406	149.0	1.00886	24.2%
WIPPpacked_mixed_120406	149.8	1.00984	24.2%
WIPPpacked_120306	149.8	0.86307	27.9%
WIPP_600um_120222	150.0	0.62677	46.4%
WIPPpacked_mixed_120319	150.0	1.16676	22.2%
WIPPpacked_mixed_120319	150.1	1.16892	22.2%
WIPPpacked_mixed_120309	150.1	1.08198	18.8%
WIPPpacked_mixed_120309	150.1	1.04819	18.8%
WIPPpacked_mixed_120319	150.2	1.14450	22.2%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120312	150.2	1.23409	17.4%
WIPPpacked_mixed_120307	150.2	1.37714	16.2%
WIPPpacked_mixed_120309	150.2	1.07841	18.8%
WIPPpacked_mixed_120312	150.2	1.24667	17.4%
WIPPpacked_mixed_120309	150.2	1.06486	18.8%
WIPPpacked_mixed_120410	150.2	1.05205	23.5%
WIPPpacked_mixed_120307	150.2	1.32388	16.2%
WIPPwetted_mixed_120305	150.2	0.78463	39.7%
WIPPpacked_mixed_120312	150.2	1.26209	17.4%
WIPPpacked_mixed_120312	150.2	1.17160	17.4%
WIPPpacked_mixed_120319	150.3	1.08289	22.2%
WIPPpacked_mixed_120308_2	150.3	1.18015	18.6%
WIPPpacked_mixed_120308_2	150.3	1.19905	18.6%
WIPPpacked_mixed_120410	150.3	1.06506	23.5%
WIPPpacked_mixed_120410	150.3	1.06775	23.5%
WIPPpacked_mixed_120410	150.3	1.06705	23.5%
WIPPpacked_mixed_120410	150.3	1.06651	23.5%
WIPP_mixed_120301	150.3	0.70356	40.2%
WIPPpacked_mixed_120410	150.3	1.06768	23.5%
WIPP_mixed_120301	150.4	0.68412	40.2%
WIPP_mixed_120301	150.4	0.70417	40.2%
WIPP_1mm_120224	150.5	0.57167	43.0%
WIPP_mixed_120301	150.5	0.64197	40.2%
WIPPpacked_mixed_120404	150.5	0.74703	24.8%
WIPPpacked_mixed_120329	150.8	0.89378	25.7%
WIPPpacked_mixed_120329	150.8	0.83931	25.7%
WIPPpellet_1p4mm_150C_120427	150.8	2.01945	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02122	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.01917	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02045	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.01923	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02189	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02297	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.01682	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02032	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02347	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02227	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02261	10.2%
WIPPpellet_1p4mm_150C_120427	150.8	2.02105	10.2%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpellet_1p4mm_150C_120427	150.8	2.02136	10.2%
WIPPpacked_mixed_120406	150.8	0.98538	24.2%
WIPPpacked_mixed_120329	150.8	0.89059	25.7%
WIPPpellet_1p4mm_150C_120427	150.8	2.01985	10.2%
WIPPpellet_1p4mm_150C_120427	150.9	2.02331	10.2%
WIPPpacked_mixed_120322	150.9	1.15439	17.7%
WIPPpellet_1p4mm_150C_120427	150.9	2.02226	10.2%
WIPPpellet_1p4mm_150C_120427	150.9	2.02063	10.2%
WIPPpellet_1p4mm_150C_120427	150.9	2.02254	10.2%
WIPPpacked_mixed_120329	150.9	0.86612	25.7%
WIPPpellet_1p4mm_150C_120427	150.9	2.02283	10.2%
WIPPpacked_mixed_120321	151.0	1.13717	18.5%
WIPPpacked_mixed_120419	151.0	1.14754	29.8%
WIPPpacked_mixed_120419	151.0	1.14788	29.8%
WIPPpacked_mixed_120419	151.0	1.14613	29.8%
WIPPpacked_mixed_120419	151.0	1.14673	29.8%
WIPPpacked_mixed_120322	151.0	1.12934	17.7%
WIPPpacked_mixed_120419	151.0	1.14650	29.8%
WIPPpacked_mixed_120419	151.1	1.14974	29.8%
WIPPpacked_mixed_120322	151.1	1.13219	17.7%
WIPPpacked_mixed_120419	151.1	1.15068	29.8%
WIPPpacked_mixed_120419	151.1	1.14922	29.8%
WIPPpacked_mixed_120419	151.1	1.14986	29.8%
WIPPpacked_mixed_120419	151.1	1.14938	29.8%
WIPPpacked_mixed_120419	151.1	1.15053	29.8%
WIPPpacked_mixed_120419	151.1	1.14878	29.8%
WIPPpacked_mixed_120419	151.1	1.14835	29.8%
WIPPpacked_mixed_120419	151.1	1.14973	29.8%
WIPPpacked_mixed_120419	151.1	1.15035	29.8%
WIPPpacked_mixed_120313	151.1	0.88651	27.4%
WIPPpacked_mixed_120419	151.1	1.14990	29.8%
WIPPpacked_mixed_120419	151.1	1.15060	29.8%
WIPPpacked_mixed_120419	151.1	1.15104	29.8%
WIPPpacked_mixed_120424_150C	151.1	1.17460	31.6%
WIPPpacked_mixed_120419	151.1	1.15196	29.8%
WIPPpacked_mixed_120419	151.1	1.14974	29.8%
WIPPpacked_mixed_120321	151.1	1.11823	18.5%
WIPPpacked_mixed_120321	151.1	1.12519	18.5%
WIPPpacked_mixed_120313	151.1	0.90775	27.4%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120424_150C	151.1	1.17685	31.6%
WIPPpacked_mixed_120424_150C	151.1	1.17509	31.6%
WIPPpacked_mixed_120313	151.2	0.88504	27.4%
WIPPpacked_mixed_120313	151.2	0.83137	27.4%
WIPPpacked_mixed_120424_150C	151.2	1.17565	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17495	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17510	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17637	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17607	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17431	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17406	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17494	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17648	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17543	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17625	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17684	31.6%
WIPPpacked_mixed_120424_150C	151.2	1.17640	31.6%
WIPPpacked_mixed_120320	151.2	1.08610	19.6%
WIPPpacked_mixed_120424_150C	151.3	1.17550	31.6%
WIPPpacked_mixed_120320	151.3	1.10546	19.6%
WIPPpacked_mixed_120308	151.3	1.22448	18.8%
WIPPpacked_mixed_120424_150C	151.3	1.17692	31.6%
WIPPpacked_mixed_120424_150C	151.3	1.17517	31.6%
WIPPpacked_mixed_120308	151.3	1.27762	18.8%
WIPPpacked_mixed_120424_150C	151.3	1.17547	31.6%
WIPPpacked_mixed_120320	151.3	1.09409	19.6%
WIPPpacked_mixed_150C_120501	151.3	0.68527	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68590	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68324	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68415	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68400	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68266	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68591	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68139	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68515	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68192	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68239	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.67942	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.68065	37.1%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_150C_120501	151.4	0.67815	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.67775	37.1%
WIPPpacked_mixed_150C_120501	151.4	0.67594	37.1%
WIPPpacked_mixed_150C_120501	151.5	0.67438	37.1%
WIPPpacked_mixed_150C_120501	151.5	0.67542	37.1%
WIPPpacked_mixed_120326	151.5	1.32618	19.2%
WIPPpacked_mixed_150C_120501	151.5	0.67331	37.1%
WIPPpacked_mixed_150C_120501	151.5	0.67131	37.1%
WIPPpacked_mixed_120326	151.5	1.33817	19.2%
WIPPpacked_mixed_120326	151.6	1.24455	19.2%
WIPPpacked_mixed_120326	151.6	1.30293	19.2%
WIPPpacked_mixed_120406	151.6	0.95314	24.2%
WIPPpacked_mixed_120328	151.7	0.99412	25.9%
WIPPpacked_mixed_120328	151.7	0.91606	25.9%
WIPP_sub600um_120228	151.9	0.64794	42.6%
WIPPpacked_mixed_120404	171.6	0.74738	24.8%
WIPPpacked_mixed_120406	172.7	1.00156	24.2%
WIPPpacked_mixed_120404	173.4	0.76559	24.8%
WIPPpacked_mixed_120406	173.4	1.01267	24.2%
WIPPpacked_mixed_120329	174.4	0.91132	25.7%
WIPPpacked_mixed_120329	174.4	0.86776	25.7%
WIPPpacked_mixed_120329	174.4	0.90709	25.7%
WIPPpacked_mixed_120404	174.5	0.74598	24.8%
WIPPpacked_mixed_120329	174.5	0.87933	25.7%
WIPPpacked_mixed_120406	174.5	0.98569	24.2%
WIPPpacked_mixed_120322	174.6	1.14952	17.7%
WIPPpacked_mixed_120322	174.6	1.14425	17.7%
WIPPpacked_mixed_120321	174.7	1.13871	18.5%
WIPPpellet_1p4mm_175C_120426	174.7	1.96399	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96435	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96296	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96072	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96128	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96189	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96172	11.2%
WIPPpacked_mixed_120321	174.7	1.13769	18.5%
WIPPpellet_1p4mm_175C_120426	174.7	1.96124	11.2%
WIPPpacked_mixed_120322	174.7	1.12623	17.7%
WIPPpellet_1p4mm_175C_120426	174.7	1.95914	11.2%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpellet_1p4mm_175C_120426	174.7	1.96188	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96028	11.2%
WIPPpellet_1p4mm_175C_120426	174.7	1.96586	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.96349	11.2%
WIPPpacked_mixed_120322	174.8	1.12999	17.7%
WIPPpellet_1p4mm_175C_120426	174.8	1.96115	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.95741	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.95908	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.95935	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.96084	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.95664	11.2%
WIPPpellet_1p4mm_175C_120426	174.8	1.95788	11.2%
WIPPpacked_mixed_120424_175C	174.8	1.18892	31.8%
WIPPpacked_mixed_120424_175C	174.8	1.18969	31.8%
WIPPpacked_mixed_120321	174.8	1.12505	18.5%
WIPPpacked_mixed_120313	174.8	0.86640	27.4%
WIPPpacked_mixed_120424_175C	174.8	1.18798	31.8%
WIPPpacked_mixed_120424_175C	174.8	1.18733	31.8%
WIPPpacked_mixed_120424_175C	174.8	1.18670	31.8%
WIPPpacked_mixed_120424_175C	174.8	1.18792	31.8%
WIPPpacked_mixed_120424_175C	174.8	1.18946	31.8%
WIPPpacked_mixed_120424_175C	174.8	1.18989	31.8%
WIPPpacked_mixed_120418	174.8	1.13988	30.0%
WIPPpacked_mixed_120321	174.8	1.11804	18.5%
WIPPpacked_mixed_120418	174.8	1.14050	30.0%
WIPPpacked_mixed_120313	174.8	0.89166	27.4%
WIPPpacked_mixed_120418	174.9	1.13649	30.0%
WIPPpacked_mixed_120418	174.9	1.13830	30.0%
WIPPpacked_mixed_120418	174.9	1.13931	30.0%
WIPPpacked_mixed_120418	174.9	1.14146	30.0%
WIPPpacked_mixed_120424_175C	174.9	1.18793	31.8%
WIPPpacked_mixed_120418	174.9	1.13956	30.0%
WIPPpacked_mixed_120418	174.9	1.13926	30.0%
WIPPpacked_mixed_120424_175C	174.9	1.18934	31.8%
WIPPpacked_mixed_120418	174.9	1.13502	30.0%
WIPPpacked_mixed_120418	174.9	1.14152	30.0%
WIPPpacked_mixed_120320	174.9	1.11981	19.6%
WIPPpacked_mixed_120424_175C	174.9	1.18812	31.8%
WIPPpacked_mixed_120424_175C	174.9	1.18737	31.8%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120418	174.9	1.13793	30.0%
WIPPpacked_mixed_120418	174.9	1.13731	30.0%
WIPPpacked_mixed_120418	174.9	1.14216	30.0%
WIPPpacked_mixed_120424_175C	174.9	1.18544	31.8%
WIPPpacked_mixed_120418	174.9	1.13940	30.0%
WIPPpacked_mixed_120418	174.9	1.13794	30.0%
WIPPpacked_mixed_120320	174.9	1.10605	19.6%
WIPPpacked_mixed_120418	174.9	1.13815	30.0%
WIPPpacked_mixed_120418	174.9	1.14189	30.0%
WIPPpacked_mixed_120424_175C	174.9	1.18550	31.8%
WIPPpacked_mixed_120424_175C	174.9	1.18697	31.8%
WIPPpacked_mixed_120418	174.9	1.13283	30.0%
WIPPpacked_mixed_120418	174.9	1.13252	30.0%
WIPPpacked_mixed_120424_175C	174.9	1.18447	31.8%
WIPPpacked_mixed_120313	174.9	0.86889	27.4%
WIPPpacked_mixed_120424_175C	174.9	1.18475	31.8%
WIPPpacked_mixed_120424_175C	175.0	1.18467	31.8%
WIPPpacked_mixed_120424_175C	175.0	1.18219	31.8%
WIPPpacked_mixed_175C_120501	175.0	0.72392	37.7%
WIPPpacked_mixed_120424_175C	175.0	1.18219	31.8%
WIPPpacked_mixed_175C_120501	175.0	0.72449	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72122	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72212	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72505	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72000	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.71715	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72500	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72738	37.7%
WIPPpacked_mixed_175C_120501	175.0	0.72741	37.7%
WIPPpacked_mixed_120309	175.0	1.04236	18.8%
WIPPpacked_mixed_120313	175.0	0.88394	27.4%
WIPPpacked_mixed_120309	175.0	1.02513	18.8%
WIPPpacked_mixed_120320	175.0	1.10740	19.6%
WIPPpacked_mixed_120319	175.0	1.10444	22.2%
WIPPpacked_mixed_175C_120501	175.0	0.72906	37.7%
WIPPpacked_mixed_175C_120501	175.1	0.72714	37.7%
WIPPpacked_mixed_175C_120501	175.1	0.72817	37.7%
WIPPpacked_mixed_175C_120501	175.1	0.73006	37.7%
WIPPpacked_mixed_175C_120501	175.1	0.73066	37.7%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_175C_120501	175.1	0.72773	37.7%
WIPPpacked_mixed_120320	175.1	1.09468	19.6%
WIPPpacked_mixed_175C_120501	175.1	0.72987	37.7%
WIPPpacked_mixed_120308_2	175.1	1.15476	18.6%
WIPPpacked_mixed_175C_120501	175.1	0.73127	37.7%
WIPPpacked_mixed_175C_120501	175.1	0.73139	37.7%
WIPPpacked_mixed_175C_120501	175.1	0.73043	37.7%
WIPPpacked_mixed_120308	175.1	1.22057	18.8%
WIPPpacked_mixed_120308_2	175.1	1.14980	18.6%
WIPPpacked_mixed_120308	175.2	1.24018	18.8%
WIPPpacked_mixed_120326	175.2	1.33682	19.2%
WIPP_mixed_120301	175.2	0.68282	40.2%
WIPP_1mm_120224	175.2	0.57991	43.0%
WIPPpacked_mixed_120404	175.3	0.75598	24.8%
WIPPpacked_mixed_120326	175.3	1.28457	19.2%
WIPP_mixed_120301	175.3	0.63989	40.2%
WIPPpacked_mixed_120406	175.3	0.98019	24.2%
WIPPpacked_mixed_120328	175.3	0.97166	25.9%
WIPP_mixed_120301	175.3	0.64740	40.2%
WIPPpacked_mixed_120326	175.4	1.31990	19.2%
WIPPpacked_mixed_120328	175.4	0.99780	25.9%
WIPPpacked_mixed_120326	175.5	1.28462	19.2%
WIPPpacked_mixed_120410	175.8	1.06809	23.5%
WIPPpacked_mixed_120312	175.9	1.20142	17.4%
WIPPpacked_mixed_120410	175.9	1.06443	23.5%
WIPPpacked_mixed_120312	175.9	1.24364	17.4%
WIPPpacked_mixed_120410	175.9	1.06469	23.5%
WIPPpacked_mixed_120410	175.9	1.06457	23.5%
WIPPpacked_mixed_120307	175.9	1.32974	16.2%
WIPPpacked_mixed_120312	175.9	1.20328	17.4%
WIPPpacked_mixed_120410	176.0	1.06455	23.5%
WIPPpacked_mixed_120410	176.0	1.06422	23.5%
WIPPpacked_mixed_120410	176.0	1.06448	23.5%
WIPPpacked_mixed_120312	176.0	1.23576	17.4%
WIPPpacked_mixed_120307	176.0	1.33174	16.2%
WIPP_600um_120222	176.7	0.64143	46.4%
WIPPpacked_mixed_120319	176.8	1.11717	22.2%
WIPPpacked_mixed_120309	176.8	1.06243	18.8%
WIPPpacked_mixed_120309	176.9	1.02980	18.8%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120329	198.7	0.91094	25.7%
WIPPpacked_mixed_120329	198.7	0.88188	25.7%
WIPPpacked_mixed_120406	198.8	0.99560	24.2%
WIPPpellet_1p4mm_200C_120425	198.8	1.89870	11.4%
WIPPpellet_1p4mm_200C_120425	198.8	1.90366	11.4%
WIPPpellet_1p4mm_200C_120425	198.9	1.90651	11.4%
WIPPpellet_1p4mm_200C_120425	198.9	1.89748	11.4%
WIPPpellet_1p4mm_200C_120425	198.9	1.90785	11.4%
WIPPpellet_1p4mm_200C_120425	198.9	1.90869	11.4%
WIPPpellet_1p4mm_200C_120425	198.9	1.91514	11.4%
WIPPpellet_1p4mm_200C_120425	198.9	1.90861	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.90721	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.91534	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.91460	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.91270	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.91111	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.90811	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.90973	11.4%
WIPPpacked_mixed_120322	199.0	1.11300	17.7%
WIPPpellet_1p4mm_200C_120425	199.0	1.91638	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.91666	11.4%
WIPPpellet_1p4mm_200C_120425	199.0	1.91543	11.4%
WIPPpacked_mixed_120322	199.0	1.11608	17.7%
WIPPpellet_1p4mm_200C_120425	199.1	1.91477	11.4%
WIPPpellet_1p4mm_200C_120425	199.1	1.91441	11.4%
WIPPpacked_mixed_120321	199.1	1.11189	18.5%
WIPPpacked_mixed_120423	199.1	1.16625	31.8%
WIPPpacked_mixed_120423	199.1	1.16546	31.8%
WIPPpacked_mixed_120423	199.1	1.16804	31.8%
WIPPpacked_mixed_120423	199.1	1.16794	31.8%
WIPPpacked_mixed_120423	199.1	1.16790	31.8%
WIPPpacked_mixed_120423	199.1	1.16865	31.8%
WIPPpacked_mixed_120423	199.1	1.16906	31.8%
WIPPpacked_mixed_120423	199.1	1.16770	31.8%
WIPPpacked_mixed_120321	199.1	1.10484	18.5%
WIPPpacked_mixed_120423	199.1	1.16585	31.8%
WIPPpacked_mixed_120423	199.1	1.15906	31.8%
WIPPpacked_mixed_120423	199.2	1.16577	31.8%
WIPPpacked_mixed_120423	199.2	1.16520	31.8%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120423	199.2	1.16468	31.8%
WIPPpacked_mixed_120423	199.2	1.16667	31.8%
WIPPpacked_mixed_120423	199.2	1.16389	31.8%
WIPPpacked_mixed_120423	199.2	1.16327	31.8%
WIPPpacked_mixed_120423	199.2	1.16242	31.8%
WIPPpacked_mixed_120423	199.2	1.16177	31.8%
WIPPpacked_mixed_120423	199.2	1.16009	31.8%
WIPPpacked_mixed_120313	199.2	0.86871	27.4%
WIPPpacked_mixed_200C_120502	199.2	0.75785	38.3%
WIPPpacked_mixed_200C_120502	199.2	0.75679	38.3%
WIPPpacked_mixed_120313	199.2	0.88815	27.4%
WIPPpacked_mixed_120423	199.2	1.15815	31.8%
WIPPpacked_mixed_200C_120502	199.2	0.75708	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75659	38.3%
WIPPpacked_mixed_120320	199.3	1.09736	19.6%
WIPPpacked_mixed_200C_120502	199.3	0.75668	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75420	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75599	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.3	0.75912	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75509	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.3	0.75946	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75527	38.3%
WIPPpacked_mixed_120320	199.3	1.08496	19.6%
WIPPpacked_mixed_200C_120502	199.3	0.75456	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.3	0.75863	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.3	0.75886	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75272	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75373	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75228	38.3%
WIPPpacked_mixed_200C_120503_ShorterTest	199.3	0.76668	38.3%
WIPPpacked_mixed_200C_120502	199.3	0.75035	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.3	0.75999	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.3	0.75943	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76062	38.3%
WIPPpacked_mixed_200C_120503_ShortTest	199.4	0.76641	38.3%
WIPPpacked_mixed_200C_120502	199.4	0.74966	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76091	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.75898	38.3%
WIPPpacked_mixed_200C_120503_ShortTest	199.4	0.76489	38.3%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_200C_120503_ShortTest	199.4	0.76629	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76139	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.75937	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76023	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.75929	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76056	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76144	38.3%
WIPPpacked_mixed_200C_120503_ShortTest	199.4	0.76255	38.3%
WIPPpacked_mixed_200C_120502	199.4	0.74296	38.3%
WIPPpacked_mixed_200C_120502	199.4	0.74963	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76125	38.3%
WIPPpacked_mixed_200C_120503_ShortTest	199.4	0.76572	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76227	38.3%
WIPPpacked_mixed_120308	199.4	1.22612	18.8%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76170	38.3%
WIPPpacked_mixed_200C_120502	199.4	0.74804	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76070	38.3%
WIPPpacked_mixed_200C_120502_reproduce	199.4	0.76026	38.3%
WIPPpacked_mixed_120308	199.4	1.22018	18.8%
WIPPpacked_mixed_200C_120502	199.5	0.74598	38.3%
WIPPpacked_mixed_200C_120502	199.5	0.74487	38.3%
WIPPpacked_mixed_120417	199.5	1.07011	31.9%
WIPPpacked_mixed_120417	199.5	1.07828	31.9%
WIPPpacked_mixed_120417	199.5	1.08097	31.9%
WIPPpacked_mixed_120417	199.5	1.07525	31.9%
WIPPpacked_mixed_120417	199.5	1.08179	31.9%
WIPPpacked_mixed_120417	199.5	1.08302	31.9%
WIPPpacked_mixed_120417	199.5	1.08338	31.9%
WIPPpacked_mixed_120417	199.6	1.08656	31.9%
WIPPpacked_mixed_120417	199.6	1.09115	31.9%
WIPPpacked_mixed_120417	199.6	1.09057	31.9%
WIPPpacked_mixed_120417	199.6	1.08805	31.9%
WIPPpacked_mixed_120417	199.6	1.08693	31.9%
WIPPpacked_mixed_120417	199.6	1.08913	31.9%
WIPPpacked_mixed_120417	199.6	1.08770	31.9%
WIPPpacked_mixed_120417	199.6	1.08900	31.9%
WIPPpacked_mixed_120417	199.6	1.09050	31.9%
WIPPpacked_mixed_120417	199.6	1.09025	31.9%
WIPPpacked_mixed_120417	199.6	1.09310	31.9%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120417	199.6	1.09406	31.9%
WIPPpacked_mixed_120326	199.6	1.30597	19.2%
WIPP_mixed_120301	199.6	0.67475	40.2%
WIPP_1mm_120224	199.6	0.58772	43.0%
WIPPpacked_mixed_120328	199.7	0.98978	25.9%
WIPPpacked_mixed_120326	199.7	1.26792	19.2%
WIPP_mixed_120301	199.7	0.64535	40.2%
WIPP_mixed_120301	199.7	0.64491	40.2%
WIPPpacked_mixed_120406	199.7	0.97011	24.2%
WIPP_sub600um_120228	200.0	0.64047	42.6%
WIPPpacked_mixed_120410	200.2	1.04777	23.5%
WIPPpacked_mixed_120410	200.2	1.04547	23.5%
WIPPpacked_mixed_120410	200.2	1.05177	23.5%
WIPPpacked_mixed_120410	200.2	1.05159	23.5%
WIPPpacked_mixed_120410	200.2	1.04941	23.5%
WIPPpacked_mixed_120312	200.2	1.19506	17.4%
WIPPpacked_mixed_120410	200.2	1.05050	23.5%
WIPPpacked_mixed_120312	200.2	1.19516	17.4%
WIPPpacked_mixed_120312	200.2	1.22496	17.4%
WIPPpacked_mixed_120312	200.2	1.23213	17.4%
WIPPpacked_mixed_120307	200.3	1.31610	16.2%
WIPPpacked_mixed_120307	200.3	1.31384	16.2%
WIPPpacked_mixed_120404	200.8	0.73909	24.8%
WIPP_600um_120222	201.0	0.65314	46.4%
WIPPpacked_mixed_120319	201.1	1.12384	22.2%
WIPPpacked_mixed_120319	201.2	1.09921	22.2%
WIPPpacked_mixed_120319	201.2	1.09876	22.2%
WIPPpacked_mixed_120309	201.3	1.02223	18.8%
WIPPpacked_mixed_120309	201.3	1.00376	18.8%
WIPPwetted_mixed_120305	201.3	0.78316	39.7%
WIPPpacked_mixed_120412	201.4	1.07510	21.7%
WIPPpacked_mixed_120412	201.4	1.07780	21.7%
WIPPpacked_mixed_120412	201.4	1.07472	21.7%
WIPPpacked_mixed_120412	201.4	1.07916	21.7%
WIPPpacked_mixed_120412	201.4	1.07902	21.7%
WIPPpacked_mixed_120308_2	201.4	1.13153	18.6%
WIPPpacked_mixed_120308_2	201.4	1.13030	18.6%
WIPPpacked_mixed_120412	201.4	1.07983	21.7%
WIPPpacked_mixed_120412	201.4	1.08051	21.7%

OLD CALIBRATION: Crushed Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
WIPPpacked_mixed_120412	201.4	1.08050	21.7%
WIPPpacked_mixed_120412	201.5	1.07956	21.7%
WIPPpacked_mixed_120412	201.5	1.08107	21.7%
WIPPpacked_mixed_120412	201.5	1.07999	21.7%
WIPPpacked_mixed_120412	201.5	1.08054	21.7%
WIPPpacked_mixed_120412	201.5	1.07946	21.7%
WIPPpacked_mixed_120411	201.5	1.08974	21.5%
WIPPpacked_mixed_120412	201.5	1.08107	21.7%
WIPPpacked_mixed_120412	201.5	1.07849	21.7%
WIPPpacked_mixed_120411	201.5	1.09163	21.5%
WIPPpacked_mixed_120411	201.5	1.09052	21.5%
WIPPpacked_mixed_120411	201.5	1.08699	21.5%
WIPPpacked_mixed_120411	201.5	1.09262	21.5%
WIPPpacked_mixed_120411	201.5	1.09281	21.5%
WIPPpacked_mixed_120411	201.5	1.08656	21.5%
WIPPpacked_mixed_120411	201.5	1.09200	21.5%
WIPPpacked_mixed_120411	201.6	1.09465	21.5%
WIPPpacked_mixed_120411	201.6	1.09090	21.5%
WIPPpacked_mixed_120411	201.6	1.09369	21.5%
WIPPpacked_mixed_120412	201.6	1.08192	21.7%
WIPPpacked_mixed_120411	201.6	1.09210	21.5%
WIPPpacked_mixed_120411	201.6	1.09331	21.5%
WIPPpacked_mixed_120412	201.6	1.08195	21.7%
WIPPpacked_mixed_120411	201.6	1.09674	21.5%
WIPPpacked_mixed_120411	201.6	1.09578	21.5%
WIPPpacked_mixed_120411	201.6	1.09405	21.5%
WIPPpacked_mixed_120411	201.6	1.09585	21.5%
WIPPpacked_mixed_120411	201.6	1.09480	21.5%
WIPPpacked_mixed_120412	201.6	1.08071	21.7%
WIPPpacked_mixed_120411	201.6	1.09592	21.5%
WIPPpacked_mixed_120412	201.6	1.08311	21.7%
WIPPpacked_mixed_120404	201.7	0.74065	24.8%
WIPPpacked_120306	201.8	0.89815	27.9%

OLD CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Solar1_125C_120510	124.9	2.19210	6.8%
Solar1_125C_120510	125.0	2.18886	6.8%
Solar1_125C_120510	125.0	2.18877	6.8%
Solar1_125C_120510	125.0	2.18058	6.8%
Solar1_125C_120510	125.0	2.19256	6.8%
Solar1_125C_120510	125.0	2.19572	6.8%
Solar1_125C_120510	125.0	2.18774	6.8%
Solar1_125C_120510	125.0	2.18895	6.8%
Solar1_125C_120510	125.0	2.18884	6.8%
Solar1_125C_120510	125.0	2.19613	6.8%
Solar1_125C_120510	125.0	2.19750	6.8%
Solar1_125C_120510	125.0	2.19881	6.8%
Solar1_125C_120510	125.1	2.20033	6.8%
Solar1_125C_120510	125.1	2.20467	6.8%
Solar1_125C_120510	125.1	2.20144	6.8%
Solar1_125C_120510	125.1	2.20100	6.8%
Solar1_125C_120510	125.1	2.20074	6.8%
Solar1_125C_120510	125.1	2.20102	6.8%
Solar1_125C_120510	125.1	2.20246	6.8%
Solar1_125C_120510	125.1	2.19958	6.8%
Native1_125C_120503	126.0	2.88566	4.0%
Native1_125C_120503	126.0	2.89201	4.0%
Native1_125C_120503	126.0	2.89270	4.0%
Native1_125C_120503	126.0	2.89189	4.0%
Native1_125C_120503	126.0	2.88528	4.0%
Native1_125C_120503	126.1	2.88938	4.0%
Native1_125C_120503	126.1	2.89175	4.0%
Native1_125C_120503	126.1	2.88867	4.0%
Native1_125C_120503	126.2	2.88334	4.0%
Native1_125C_120503	126.2	2.88388	4.0%
Native1_125C_120503	126.2	2.88403	4.0%
Native1_125C_120503	126.2	2.89184	4.0%
Native1_125C_120503	126.2	2.88958	4.0%
Native1_125C_120503	126.3	2.88672	4.0%
Native1_125C_120503	126.3	2.89000	4.0%
Native1_125C_120503	126.3	2.88438	4.0%
Native1_125C_120503	126.3	2.88426	4.0%
Native1_125C_120503	126.3	2.89120	4.0%

OLD CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Native1_125C_120503	126.3	2.88583	4.0%
Native1_125C_120503	126.3	2.88894	4.0%
Native1_150C_120504	149.7	2.66331	4.6%
Native1_150C_120504	149.7	2.66244	4.6%
Native1_150C_120504	149.7	2.65516	4.6%
Native1_150C_120504	149.7	2.66508	4.6%
Native1_150C_120504	149.7	2.66196	4.6%
Native1_150C_120504	149.7	2.65947	4.6%
Native1_150C_120504	149.7	2.66382	4.6%
Native1_150C_120504	149.7	2.66347	4.6%
Native1_150C_120504	149.7	2.66445	4.6%
Native1_150C_120504	149.7	2.65928	4.6%
Native1_150C_120504	149.7	2.66436	4.6%
Native1_150C_120504	149.7	2.66262	4.6%
Native1_150C_120504	149.7	2.66220	4.6%
Native1_150C_120504	149.7	2.65959	4.6%
Native1_150C_120504	149.7	2.66190	4.6%
Native1_150C_120504	149.7	2.65446	4.6%
Native1_150C_120504	149.7	2.65176	4.6%
Native1_150C_120504	149.7	2.65362	4.6%
Native1_150C_120504	149.7	2.65583	4.6%
Native1_150C_120504	149.7	2.65745	4.6%
Solar1_150C_120511	151.2	2.18471	6.9%
Solar1_150C_120511	151.2	2.18512	6.9%
Solar1_150C_120511	151.2	2.18491	6.9%
Solar1_150C_120511	151.2	2.18835	6.9%
Solar1_150C_120511	151.2	2.18445	6.9%
Solar1_150C_120511	151.2	2.18559	6.9%
Solar1_150C_120511	151.2	2.18596	6.9%
Solar1_150C_120511	151.2	2.18114	6.9%
Solar1_150C_120511	151.2	2.18637	6.9%
Solar1_150C_120511	151.2	2.18692	6.9%
Solar1_150C_120511	151.2	2.18375	6.9%
Solar1_150C_120511	151.2	2.18469	6.9%
Solar1_150C_120511	151.2	2.18320	6.9%
Solar1_150C_120511	151.2	2.18644	6.9%
Solar1_150C_120511	151.2	2.18991	6.9%
Solar1_150C_120511	151.3	2.18587	6.9%
Solar1_150C_120511	151.3	2.18486	6.9%

OLD CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Solar1_150C_120511	151.3	2.18392	6.9%
Solar1_150C_120511	151.3	2.18168	6.9%
Solar1_150C_120511	151.3	2.17989	6.9%
Native1_175C_120507	173.1	2.63326	5.2%
Native1_175C_120507	173.1	2.63464	5.2%
Native1_175C_120507	173.1	2.62621	5.2%
Native1_175C_120507	173.1	2.63522	5.2%
Native1_175C_120507	173.1	2.63905	5.2%
Native1_175C_120507	173.1	2.63179	5.2%
Native1_175C_120507	173.1	2.63129	5.2%
Native1_175C_120507	173.1	2.63433	5.2%
Native1_175C_120507	173.1	2.63658	5.2%
Native1_175C_120507	173.1	2.63989	5.2%
Native1_175C_120507	173.1	2.63206	5.2%
Native1_175C_120507	173.2	2.63472	5.2%
Native1_175C_120507	173.2	2.63805	5.2%
Native1_175C_120507	173.2	2.63398	5.2%
Native1_175C_120507	173.2	2.63397	5.2%
Native1_175C_120507	173.2	2.63468	5.2%
Native1_175C_120507	173.2	2.62999	5.2%
Native1_175C_120507	173.2	2.63495	5.2%
Native1_175C_120507	173.2	2.63356	5.2%
Native1_175C_120507	173.2	2.62976	5.2%
Solar1_175C_120514	174.9	2.18856	7.1%
Solar1_175C_120514	174.9	2.18861	7.1%
Solar1_175C_120514	175.0	2.18366	7.1%
Solar1_175C_120514	175.0	2.18833	7.1%
Solar1_175C_120514	175.0	2.19000	7.1%
Solar1_175C_120514	175.0	2.18432	7.1%
Solar1_175C_120514	175.0	2.19104	7.1%
Solar1_175C_120514	175.0	2.18554	7.1%
Solar1_175C_120514	175.0	2.18442	7.1%
Solar1_175C_120514	175.0	2.18245	7.1%
Solar1_175C_120514	175.0	2.18333	7.1%
Solar1_175C_120514	175.0	2.18404	7.1%
Solar1_175C_120514	175.0	2.18440	7.1%
Solar1_175C_120514	175.0	2.18919	7.1%
Solar1_175C_120514	175.0	2.18601	7.1%
Solar1_175C_120514	175.0	2.18656	7.1%

OLD CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Solar1_175C_120514	175.0	2.18970	7.1%
Solar1_175C_120514	175.0	2.18467	7.1%
Solar1_175C_120514	175.0	2.18902	7.1%
Solar1_175C_120514	175.1	2.18723	7.1%
Native1_200C_120507	198.5	2.66257	6.1%
Native1_200C_120507	198.5	2.66077	6.1%
Native1_200C_120507	198.5	2.65914	6.1%
Native1_200C_120507	198.5	2.66414	6.1%
Native1_200C_120507	198.6	2.61910	6.1%
Native1_200C_120507	198.6	2.65238	6.1%
Native1_200C_120507	198.6	2.65260	6.1%
Native1_200C_120507	198.6	2.62028	6.1%
Native1_200C_120507	198.6	2.65151	6.1%
Native1_200C_120507	198.6	2.63560	6.1%
Native1_200C_120507	198.6	2.64809	6.1%
Native1_200C_120507	198.7	2.62419	6.1%
Native1_200C_120507	198.7	2.63758	6.1%
Native1_200C_120507	198.7	2.63094	6.1%
Native1_200C_120507	198.7	2.62249	6.1%
Native1_200C_120507	198.7	2.64799	6.1%
Native1_200C_120507	198.7	2.64456	6.1%
Native1_200C_120507	198.7	2.63823	6.1%
Native1_200C_120507	198.7	2.64477	6.1%
Native1_200C_120507	198.7	2.64618	6.1%
Solar1_200C_120514	199.4	2.10978	7.1%
Solar1_200C_120514	199.4	2.10904	7.1%
Solar1_200C_120514	199.4	2.11194	7.1%
Solar1_200C_120514	199.4	2.11323	7.1%
Solar1_200C_120514	199.4	2.10991	7.1%
Solar1_200C_120514	199.4	2.11342	7.1%
Solar1_200C_120514	199.4	2.11116	7.1%
Solar1_200C_120514	199.5	2.11215	7.1%
Solar1_200C_120514	199.5	2.10703	7.1%
Solar1_200C_120514	199.5	2.10562	7.1%
Solar1_200C_120514	199.5	2.11633	7.1%
Solar1_200C_120514	199.5	2.11821	7.1%
Solar1_200C_120514	199.5	2.11720	7.1%
Solar1_200C_120514	199.5	2.11375	7.1%
Solar1_200C_120514	199.5	2.11936	7.1%

OLD CALIBRATION: Domal and Solar Salt			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Solar1_200C_120514	199.5	2.11958	7.1%
Solar1_200C_120514	199.5	2.11938	7.1%
Solar1_200C_120514	199.5	2.12287	7.1%
Solar1_200C_120514	199.5	2.11983	7.1%
Solar1_200C_120514	199.5	2.11817	7.1%

APPENDIX 2

Single Crystal Thermal Conductivity

Single-crystal data from new hot disk apparatus			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Single crystal A+B	-75.0	9.892	0.0%
Single crystal A+B	-75.0	9.897	0.0%
Single crystal A+B	-75.0	9.893	0.0%
Single crystal A+B	-75.0	9.943	0.0%
Single crystal A+B	-75.0	9.873	0.0%
Single crystal A+B	-50.0	8.571	0.0%
Single crystal A+B	-50.0	8.542	0.0%
Single crystal A+B	-50.0	8.495	0.0%
Single crystal A+B	-50.0	8.529	0.0%
Single crystal A+B	-50.0	8.530	0.0%
Single crystal A+B	-50.0	8.527	0.0%
Single crystal A+B	-50.0	8.533	0.0%
Single crystal A+B	-50.0	8.513	0.0%
Single crystal A+B	-25.0	7.580	0.0%
Single crystal A+B	-25.0	7.596	0.0%
Single crystal A+B	-25.0	7.594	0.0%
Single crystal A+B	-25.0	7.588	0.0%
Single crystal A+B	-25.0	7.594	0.0%
Single crystal A+B	-25.0	7.596	0.0%
Single crystal A+B	-25.0	7.574	0.0%
Single crystal A+B	-25.0	7.583	0.0%
Single crystal A+B	0.0	6.816	0.0%
Single crystal A+B	0.0	6.784	0.0%
Single crystal A+B	0.0	6.789	0.0%
Single crystal A+B	0.0	6.770	0.0%
Single crystal A+B	0.0	6.748	0.0%
Single crystal A+B	0.0	6.740	0.0%
Single crystal A+B	0.0	6.755	0.0%
Single crystal A+B	0.0	6.750	0.0%
Single crystal A+B	25.0	6.058	0.0%
Single crystal A+B	25.0	6.033	0.0%
Single crystal A+B	25.0	6.053	0.0%
Single crystal A+B	25.0	6.045	0.0%
Single crystal A+B	25.0	6.065	0.0%

Single-crystal data from new hot disk apparatus			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Single crystal A+B	25.0	6.041	0.0%
Single crystal A+B	25.0	6.051	0.0%
Single crystal A+B	25.0	6.048	0.0%
Single crystal A+B	29.0	5.963	0.0%
Single crystal A+B	29.0	5.958	0.0%
Single crystal A+B	29.0	5.970	0.0%
Single crystal A+B	29.0	5.979	0.0%
Single crystal A+B	29.0	5.968	0.0%
Single crystal A+B	40.0	5.678	0.0%
Single crystal A+B	40.0	5.665	0.0%
Single crystal A+B	40.0	5.676	0.0%
Single crystal A+B	40.0	5.658	0.0%
Single crystal A+B	40.0	5.690	0.0%
Single crystal A+B	40.0	5.702	0.0%
Single crystal A+B	40.0	5.712	0.0%
Single crystal A+B	40.0	5.710	0.0%
Single crystal A+B	50.0	5.498	0.0%
Single crystal A+B	50.0	5.489	0.0%
Single crystal A+B	50.0	5.490	0.0%
Single crystal A+B	50.0	5.491	0.0%
Single crystal A+B	50.0	5.492	0.0%
Single crystal A+B	50.0	5.475	0.0%
Single crystal A+B	50.0	5.488	0.0%
Single crystal A+B	50.0	5.477	0.0%
Single crystal A+B	75.0	5.066	0.0%
Single crystal A+B	75.0	5.082	0.0%
Single crystal A+B	75.0	5.106	0.0%
Single crystal A+B	75.0	5.098	0.0%
Single crystal A+B	75.0	5.092	0.0%
Single crystal A+B	75.0	5.030	0.0%
Single crystal A+B	75.0	5.081	0.0%
Single crystal A+B	75.0	5.069	0.0%
Single crystal A+B	100.0	4.662	0.0%
Single crystal A+B	100.0	4.666	0.0%
Single crystal A+B	100.0	4.685	0.0%
Single crystal A+B	100.0	4.674	0.0%
Single crystal A+B	100.0	4.686	0.0%
Single crystal A+B	100.0	4.634	0.0%
Single crystal A+B	100.0	4.623	0.0%

Single-crystal data from new hot disk apparatus			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Single crystal A+B	100.0	4.632	0.0%
Single crystal A+B	125.0	4.263	0.0%
Single crystal A+B	125.0	4.263	0.0%
Single crystal A+B	125.0	4.239	0.0%
Single crystal A+B	125.0	4.245	0.0%
Single crystal A+B	125.0	4.284	0.0%
Single crystal A+B	125.0	4.260	0.0%
Single crystal A+B	125.0	4.240	0.0%
Single crystal A+B	125.0	4.232	0.0%
Single crystal A+B	150.0	3.879	0.0%
Single crystal A+B	150.0	3.900	0.0%
Single crystal A+B	150.0	3.904	0.0%
Single crystal A+B	150.0	3.898	0.0%
Single crystal A+B	150.0	3.906	0.0%
Single crystal A+B	150.0	3.896	0.0%
Single crystal A+B	150.0	3.896	0.0%
Single crystal A+B	150.0	3.895	0.0%
Single crystal A+B	175.0	3.615	0.0%
Single crystal A+B	175.0	3.613	0.0%
Single crystal A+B	175.0	3.610	0.0%
Single crystal A+B	175.0	3.620	0.0%
Single crystal A+B	175.0	3.618	0.0%
Single crystal A+B	175.0	3.663	0.0%
Single crystal A+B	175.0	3.654	0.0%
Single crystal A+B	175.0	3.657	0.0%
Single crystal A+B	200.0	3.351	0.0%
Single crystal A+B	200.0	3.355	0.0%
Single crystal A+B	200.0	3.357	0.0%
Single crystal A+B	200.0	3.362	0.0%
Single crystal A+B	200.0	3.349	0.0%
Single crystal A+B	200.0	3.408	0.0%
Single crystal A+B	200.0	3.419	0.0%
Single crystal A+B	200.0	3.409	0.0%
Single crystal A+B	225.0	3.166	0.0%
Single crystal A+B	225.0	3.162	0.0%
Single crystal A+B	225.0	3.152	0.0%
Single crystal A+B	225.0	3.161	0.0%
Single crystal A+B	225.0	3.174	0.0%
Single crystal A+B	225.0	3.188	0.0%

Single-crystal data from new hot disk apparatus			
Sample	**Temp (°C)**	**λ (W/mK)**	**Porosity**
Single crystal A+B	225.0	3.191	0.0%
Single crystal A+B	225.0	3.179	0.0%
Single crystal A+B	250.0	2.989	0.0%
Single crystal A+B	250.0	3.003	0.0%
Single crystal A+B	250.0	3.006	0.0%
Single crystal A+B	250.0	2.997	0.0%
Single crystal A+B	250.0	3.020	0.0%
Single crystal A+B	250.0	3.009	0.0%
Single crystal A+B	250.0	3.002	0.0%
Single crystal A+B	250.0	3.005	0.0%
Single crystal A+B	275.0	2.853	0.0%
Single crystal A+B	275.0	2.861	0.0%
Single crystal A+B	275.0	2.851	0.0%
Single crystal A+B	275.0	2.846	0.0%
Single crystal A+B	275.0	2.841	0.0%
Single crystal A+B	275.0	2.866	0.0%
Single crystal A+B	275.0	2.832	0.0%
Single crystal A+B	275.0	2.847	0.0%
Single crystal A+B	300.0	2.710	0.0%
Single crystal A+B	300.0	2.696	0.0%
Single crystal A+B	300.0	2.702	0.0%
Single crystal A+B	300.0	2.708	0.0%
Single crystal A+B	300.0	2.694	0.0%
Single crystal A+B	300.0	2.706	0.0%
Single crystal A+B	300.0	2.693	0.0%
Single crystal A+B	300.0	2.686	0.0%

APPENDIX 3

TCA data

	Porosity
CS2.5	2.54%
CS2.6	2.63%
Average	2.59%

	Data Set 1			Data Set 2			Data Set 3			Data Set 4		
	Comp_Salt_CS2526_nnnC_Set1.hotx			Comp_Salt_CS2526_nnnC_Set2.hotx			Comp_Salt_CS2526_nnnC_Set3.hotx			Comp_Salt_CS2526_nnnC_Set4.hotx		
	Char.: CS2.5/CS2.6			**Char.: CS2.5/CS2.6**			**Char.: CS2.5/CS2.6**			**Char.: CS2.5/CS2.6**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	3.031	1.836	1.651	3.041	1.843	1.650	3.041	1.852	1.642	3.057	1.853	1.650
50	2.968	1.728	1.718	3.013	1.755	1.717	3.000	1.758	1.706	3.011	1.754	1.716
100	2.898	1.463	1.982	2.901	1.473	1.969	2.903	1.474	1.970	2.911	1.477	1.971
150	2.794	1.285	2.174	2.794	1.287	2.171	2.794	1.284	2.176	2.793	1.282	2.179
200	2.648	1.116	2.372	2.650	1.116	2.373	2.655	1.121	2.369	2.655	1.120	2.370
250	2.506	0.990	2.530	2.506	0.9912	2.528	2.516	1.001	2.513	2.515	1.001	2.512
300	2.347	0.891	2.635	2.363	0.9029	2.617	2.350	0.8970	2.620	2.360	0.9045	2.609

	Porosity
CS3.2	3.23%
CS3.3	3.26%
Average	3.25%

	Data Set 1			Data Set 2			Data Set 3			Data Set 4		
	Comp_Salt_CS3233_nnnC_Set1.hotx			Comp_Salt_CS3233_nnnC_Set2.hotx			Comp_Salt_CS3233_nnnC_Set3.hotx			Comp_Salt_CS3233_nnnC_Set4.hotx		
	Char.: CS3.2/CS3.3			**Char.: CS3.2/CS3.3**			**Characteristics: CS3.2/CS3.3**			**Char.: CS3.2/CS3.3**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	3.133	1.760	1.781	3.122	1.748	1.786	3.115	1.739	1.791	3.103	1.727	1.797
50	3.082	1.640	1.879	3.079	1.647	1.869	3.085	1.650	1.870	3.086	1.643	1.878
100	2.943	1.412	2.083	2.939	1.413	2.081	2.958	1.417	2.088	2.953	1.414	2.088
150	2.832	1.254	2.258	2.840	1.249	2.274	2.840	1.256	2.261	2.838	1.256	2.259
200	2.712	1.097	2.473	2.719	1.113	2.442	2.719	1.119	2.431	2.718	1.117	2.433
250	2.574	0.9812	2.623	2.581	0.9855	2.619	2.586	0.9787	2.643	2.584	0.9886	2.614
300	2.442	0.9148	2.669	2.439	0.9114	2.676	2.433	0.9118	2.668	2.441	0.9017	2.707

	Porosity
CS4.5	4.49%
CS4.6	4.61%
Average	4.55%

	Data Set 1			Data Set 2			Data Set 3			Data Set 4		
	Comp_Salt_CS4546_nnnC_Set1.hotx			Comp_Salt_CS4546_nnnC_Set2.hotx			Comp_Salt_CS4546_nnnC_Set3.hotx			Comp_Salt_CS4546_nnnC_Set4.hotx		
	Characteristics: CS4.5/CS4.6			**Characteristics: CS4.5/CS4.6**			**Char.: CS4.5/CS4.6**			**Char.: CS4.5/CS4.6**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	3.4030	1.7600	1.933	3.2790	1.8150	1.806	3.2510	1.7900	1.816	3.2470	1.8110	1.798
50	3.2670	1.8130	1.802	3.2210	1.7960	1.793	3.2060	1.7860	1.7950	3.2200	1.7970	1.792
100	3.2540	1.5060	2.161	3.1560	1.5580	2.026	3.1460	1.1580	1.983	3.1210	1.5030	2.077
150	2.9120	1.3350	2.182	2.9110	1.3320	2.185	2.9230	1.3480	2.169	2.9260	1.3410	2.183
200	2.7720	1.1790	2.352	2.7670	1.1830	2.340	2.7700	1.1750	2.357	2.7610	1.1730	2.354
250	2.6180	1.0510	2.492	2.6210	1.0580	2.478	2.6240	1.0660	2.461	2.6320	1.0690	2.462
300	2.448	0.9526	2.570	2.463	0.9702	2.539	2.469	0.9709	2.543	2.47	0.9725	2.540

	Porosity
CS4.9	4.91%
CS5.2	5.15%

Average	5.03%

		Data Set 1				Data Set 2				Data Set 3				Data Set 4	
	Comp_Salt_CS4952_nnnC_Set1.hotx				Comp_Salt_CS4952_nnnC_Set2.hotx				Comp_Salt_CS4952_nnnC_Set3.hotx				Comp_Salt_CS4952_nnnC_Set4.hotx	
	Characteristics: CS4.9/CS5.2				**Characteristics: CS4.9/CS5.2**				**Characteristics: CS4.9/CS5.2**				**Char.: CS4.9/CS5.2**	
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	3.1650	1.7040	1.857	17	3.1600	1.7180	1.839	18	3.1640	1.7120	1.849	19	3.1570	1.7120	1.844
50	3.1320	1.6380	1.911		3.1310	1.6540	1.893		3.1380	1.6550	1.8960		3.1330	1.6380	1.913
100	3.0270	1.4500	2.088		3.0260	1.4440	2.095		3.0330	1.4480	2.094		3.0320	1.4580	2.080
150	2.9280	1.2960	2.259		2.9090	1.2820	2.270		2.9150	1.2930	2.254		2.9090	1.2870	2.261
200	2.7640	1.1460	2.412		2.7760	1.1500	2.414		2.7760	1.1660	2.382		2.7630	1.1350	2.435
250	2.6360	1.0420	2.530		2.6290	1.0360	2.537		2.6410	1.0440	2.529		2.6390	1.0360	2.548
300	2.463	0.9314	2.644	5	2.469	0.9281	2.660	6	2.461	0.9403	2.617	7	2.453	0.9369	2.619

	Porosity
CS6.4	6.35%
CS6.9	6.92%
Average	6.64%

		Data Set 1				Data Set 2				Data Set 3				Data Set 4	
	Comp_Salt_CS6469_nnnC_Set1.hotx				Comp_Salt_CS6469_nnnC_Set2.hotx				Comp_Salt_CS6469_nnnC_Set3.hotx				Comp_Salt_CS6469_nnnC_Set4.hotx	
	Characteristics: CS6.4/CS6.9				**Characteristics: CS6.4/CS6.9**				**Characteristics: CS6.4/CS6.9**				**Char.: CS6.4/CS6.9**	
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	3.229	1.953	1.653	7	3.215	1.957	1.643	8	3.208	1.920	1.671	9	3.207	1.913	1.677
50	3.146	1.837	1.713	13	3.170	1.847	1.716	14	3.165	1.848	1.712	15	3.173	1.848	1.718
100	3.060	1.587	1.928	7	3.055	1.585	1.927	8	3.056	1.586	1.932	9	3.054	1.588	1.923
150	2.899	1.379	2.102		2.873	1.388	2.070		2.891	1.373	2.105		2.858	1.384	2.066
200	2.744	1.220	2.249		2.686	1.160	2.317		2.740	1.209	2.266		2.750	1.209	2.274
250	2.581	1.068	2.417	3	2.587	1.085	2.384	4	2.591	1.083	2.392	5	2.589	1.099	2.356
300	2.408	0.9509	2.532		2.401	0.9613	2.497		2.404	0.963	2.497		2.416	0.9763	2.474

	Porosity
CS11.0	11.03%
CS11.3	11.26%
Average	11.15%

		Data Set 1				Data Set 2				Data Set 3				Data Set 4	
	Comp_Salt_CS110113_nnnC_Set1.hotx				Comp_Salt_CS110113_nnnC_Set2.hotx				Comp_Salt_CS110113_nnnC_Set3.hotx				Comp_Salt_CS110113_nnnC_Set4.hotx	
	Char.: CS11.0/CS11.3				**Characteristics: CS11.0/CS11.3**				**Characteristics: CS11.0/CS11.3**				**Char.: CS11.0/CS11.3**	
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	2.5830	1.0340	2.498	5	2.5840	1.0270	2.515	6	2.5900	1.0260	2.525	7	2.6310	1.0970	2.399
50	2.6600	1.1500	2.313		2.5990	1.0770	2.413		2.6140	1.0760	2.4280		2.6150	1.0790	2.423
100	2.5310	0.9900	2.557		2.5390	0.9923	2.559		2.5420	0.9962	2.551		2.5380	1.0010	2.536
150	2.4920	0.9368	2.661		2.4820	0.9318	2.664		2.4840	0.9337	2.661		2.4970	0.9472	2.636
200	2.3420	0.8530	2.746		2.3410	0.8549	2.738		2.3560	0.8737	2.397		2.3390	0.8537	2.740
250	2.2310	0.7956	2.804	2	2.2310	0.7918	2.818	3	2.2310	0.7938	2.810	4	2.2420	0.7986	2.808
300	2.101	0.7488	2.806	9	2.093	0.736	2.844	10	2.094	0.7435	2.817	11	2.103	0.7496	2.805

	Porosity
CS12.4	12.41%
CS12.7	12.66%
Average	12.53%

		Data Set 1				Data Set 2				Data Set 3				Data Set 4	
	Comp_Salt_CS124127_nnnC_Set1.hotx				Comp_Salt_CS124127_nnnC_Set2.hotx				Comp_Salt_CS124127_nnnC_Set3.hotx				Comp_Salt_CS124127_nnnC_Set4.hotx		
	Characteristics: CS12.4/CS12.7				**Characteristics: CS12.4/CS12.7**				**Characteristics: CS12.4/CS12.7**				**Char.: CS12.4/CS12.7**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	2.6950	1.7290	1.558	9	2.6850	1.7150	1.566	10	2.6750	1.7090	1.565	11	2.6770	1.7100	1.566
50	2.6510	1.6270	1.630		2.6570	1.6270	1.633		2.6470	1.6200	1.6340		2.6530	1.6470	1.611
100	2.5490	1.4210	1.794		2.5550	1.4160	1.805		2.5530	1.4150	1.803		2.5440	1.4110	1.804
150	2.4520	1.2480	1.964		2.4330	1.2410	1.960		2.4290	1.2370	1.963		2.4370	1.2450	1.957
200	2.3170	1.0880	2.129		2.3180	1.0880	2.129		2.3310	1.0960	2.127		2.3280	1.0980	2.121
250	2.2000	0.9826	2.239		2.2010	0.9813	2.243		2.2060	0.9850	2.239		2.2060	0.9805	2.250
300	2.073	0.8909	2.327		2.058	0.8865	2.322		2.062	0.9005	2.289		2.059	0.8868	2.321
250	2.194	0.968	2.268		2.196	0.963	2.282		2.189	0.960	2.281		2.199	0.969	2.269
200	2.294	1.068	2.148		2.305	1.078	2.139		2.302	1.078	2.136		2.289	1.065	2.150
150	2.402	1.192	2.015		2.419	1.211	1.997		2.417	1.210	1.998		2.419	1.211	1.997
100	2.499	1.374	1.818		2.506	1.378	1.818		2.501	1.381	1.811		2.498	1.382	1.808
50	2.658	1.657	1.604		2.615	1.600	1.635		2.614	1.599	1.635		2.616	1.598	1.638
36	2.641	1.686	1.566		2.640	1.685	1.567		2.639	1.670	1.580		2.634	1.678	1.570

	Porosity
CS12.5	12.47%
CS13.2	13.20%
Average	12.83%

		Mixed Sets				Mixed Sets				Mixed Sets				Mixed Sets	
	Comp_Salt_CS125132_nnnC_SetM.hotx				Comp_Salt_CS125132_nnnC_SetM.hotx				Comp_Salt_CS125132_nnnC_SetM.hotx				Comp_Salt_CS125132_nnnC_SetM.hotx		
	Characteristics: CS12.5/CS13.2				**Characteristics: CS12.5/CS13.2**				**Characteristics: CS12.5/CS13.2**				**Char.: CS12.5/CS13.2**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	3.978	2.413	1.649	11	3.454	2.245	1.538	13	3.694	1.501	2.462	15	3.368	1.971	1.709
50	3.533	2.361	1.497	5	3.283	1.933	1.698	6	3.414	1.953	1.749	7	3.248	1.875	1.732
100	3.224	1.567	2.058	1	3.084	1.635	1.886	2	3.040	1.507	2.017	3	3.045	1.558	1.954
150	2.923	1.340	2.181	1	2.861	1.562	1.832	2	2.814	1.350	2.085	3	2.805	1.398	2.007
200	2.592	1.125	2.304	1	2.588	1.098	2.356	2	2.600	1.225	2.123	3	2.612	1.143	2.285
250	2.432	1.012	2.403	1	2.423	1.008	2.404	2	2.428	1.018	2.384	3	2.430	1.018	2.388
300	2.281	0.9525	2.395	3	2.283	0.9569	2.386	4	2.271	0.9468	2.398	5	2.287	0.9518	2.403

	Porosity
CS13.2	13.17%
CS13.4	13.38%
Average	13.28%

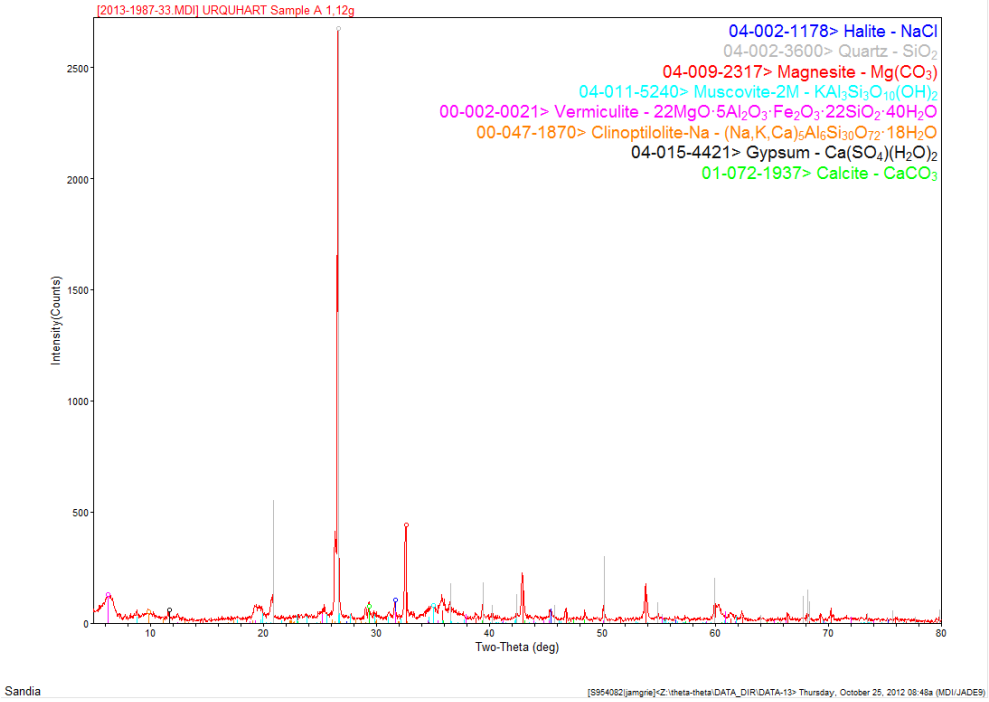
		Data Set 1				Data Set 2				Data Set 3				Data Set 4	
	Comp_Salt_CS132134_nnnC_Set1.hotx				Comp_Salt_CS132134_nnnC_Set2.hotx				Comp_Salt_CS132134_nnnC_Set3.hotx				Comp_Salt_CS132134_nnnC_Set4.hotx		
	Characteristics: CS13.2/CS13.4				**Characteristics: CS13.2/CS13.4**				**Characteristics: CS13.2/CS13.4**				**Char.: CS13.2/CS13.4**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	2.6870	1.6330	1.646		2.6950	1.6460	1.637		2.6880	1.6430	1.636		2.6890	1.6420	1.638
50	2.6690	1.6060	1.662		2.6730	1.6100	1.66		2.6730	1.6070	1.6630		2.6690	1.6030	1.665
100	2.5630	1.4230	1.801		2.5670	1.4280	1.798		2.5790	1.4280	1.806		2.5640	1.4240	1.801
150	2.4720	1.2820	1.928		2.4680	1.2760	1.933		2.4640	1.2720	1.937		2.4600	1.2720	1.934
200	2.3600	1.1520	2.049		2.3460	1.1410	2.057		2.3600	1.1510	2.049		2.3700	1.1560	2.050
250	2.2620	1.0510	2.152		2.2500	1.0490	2.145		2.2510	1.0430	2.158		2.2420	1.0390	2.159
300	2.124	0.9577	2.218		2.118	0.9579	2.212		2.128	0.9512	2.237		2.129	0.9592	2.220
250	2.247	1.029	2.183		2.251	1.018	2.211		2.248	1.026	2.192		2.247	1.026	2.190
200	2.345	1.108	2.177		2.346	1.110	2.114		2.336	1.096	2.131		2.345	1.103	2.126
150	2.446	1.215	2.013		2.449	1.219	2.009		2.449	1.217	2.012		2.454	1.227	2.000
100	2.543	1.363	1.865		2.546	1.361	1.871		2.553	1.362	1.874		2.557	1.377	1.857
50	2.639	1.535	1.719		2.639	1.537	1.717		2.636	1.535	1.717		2.629	1.533	1.714
36	2.692	1.640	1.641		2.675	1.621	1.650		2.669	1.619	1.648		2.665	1.597	1.669

	Porosity
CS17.0	16.97%
CS17.2	17.17%
Average	17.07%

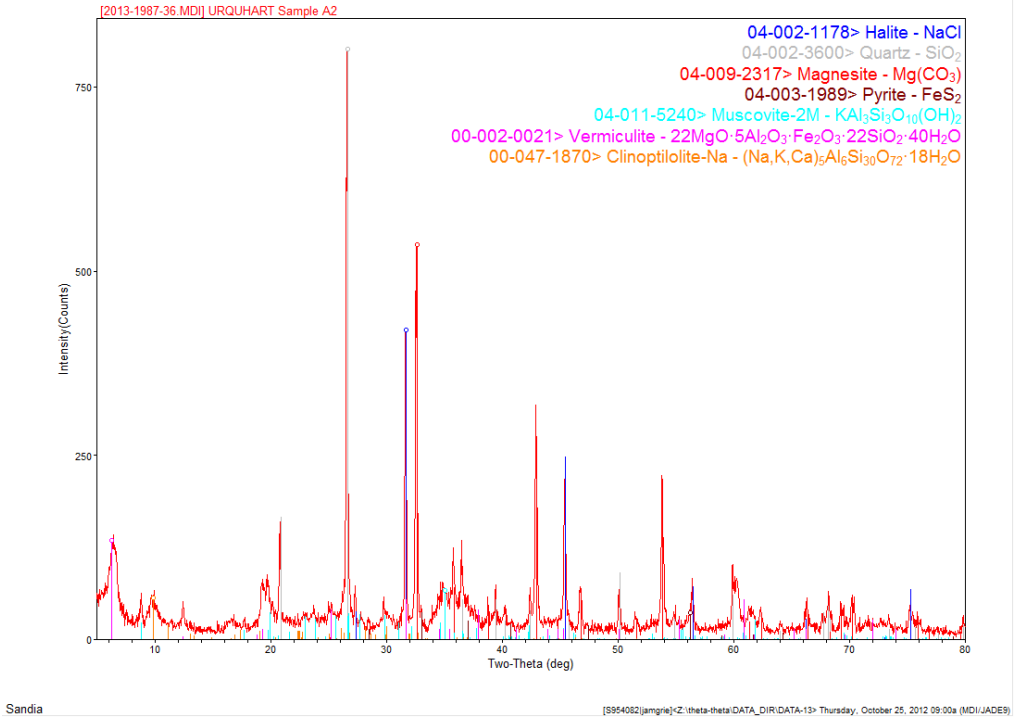
		Data Set 5				Data Set 2				Data Set 3				Data Set 4	
	Comp_Salt_CS170172_nnnC_Set1.hotx				Comp_Salt_CS170172_nnnC_Set2.hotx				Comp_Salt_CS170172_nnnC_Set3.hotx				Comp_Salt_CS170172_nnnC_Set4.hotx		
	Characteristics: CS17.0/CS17.2				**Characteristics: CS17.0/CS17.2**				**Characteristics: CS17.0/CS17.2**				**Char.: CS17.0/CS17.2**		
	TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K		TC, W/mK	TD, mm^2/s	SH, MJ/m^3K
36	2.4950	1.4410	1.731	5	2.4940	1.4400	1.732	6	1.4970	1.4380	1.737	7	2.4970	1.4380	1.736
50	2.470	1.392	1.774	5	2.469	1.384	1.784	6	1.475	1.389	1.782	7	2.478	1.399	1.771
100	2.369	1.220	1.943	7	2.374	1.214	1.955	8	2.382	1.222	1.950	9	2.367	2.214	1.950
150	2.257	1.083	2.085	5	2.257	1.079	2.092	6	2.265	1.082	2.093	7	2.257	1.084	2.082
200	2.0330	0.8787	2.314		2.0310	0.8752	2.321		2.0330	0.8772	2.317		2.0230	0.8724	2.319
250	2.0330	0.8787	2.314		2.0310	0.8752	2.321		2.0330	0.8772	2.317		2.0230	0.8724	2.319
300	1.866	0.7303	2.555	17	1.869	0.7331	2.549	18	1.869	0.7311	2.556	19	1.876	0.7372	2.544

APPENDIX 4

X-ray diffraction data on water insoluble WIPP salt impurities

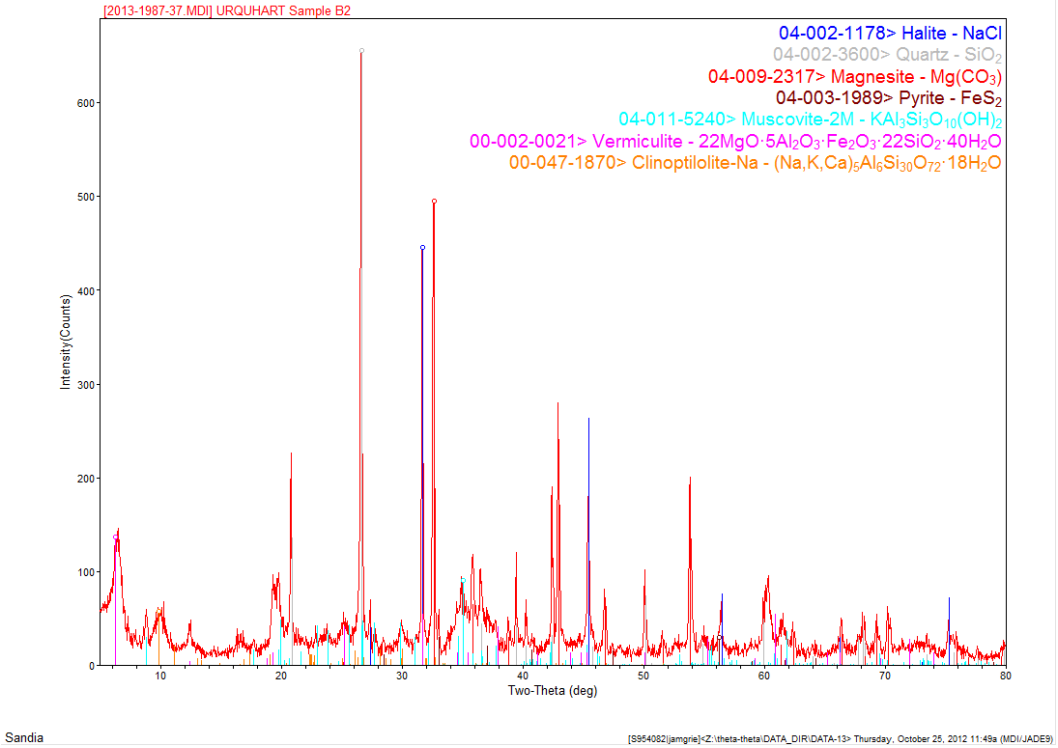


Sample A

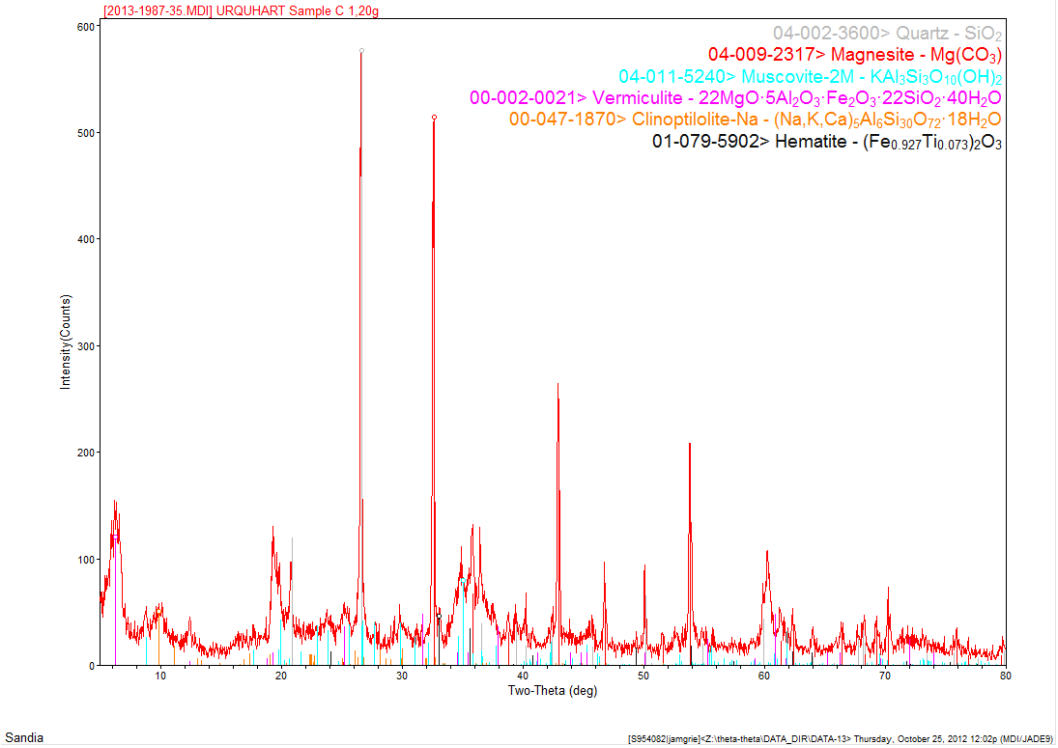


Sample A2

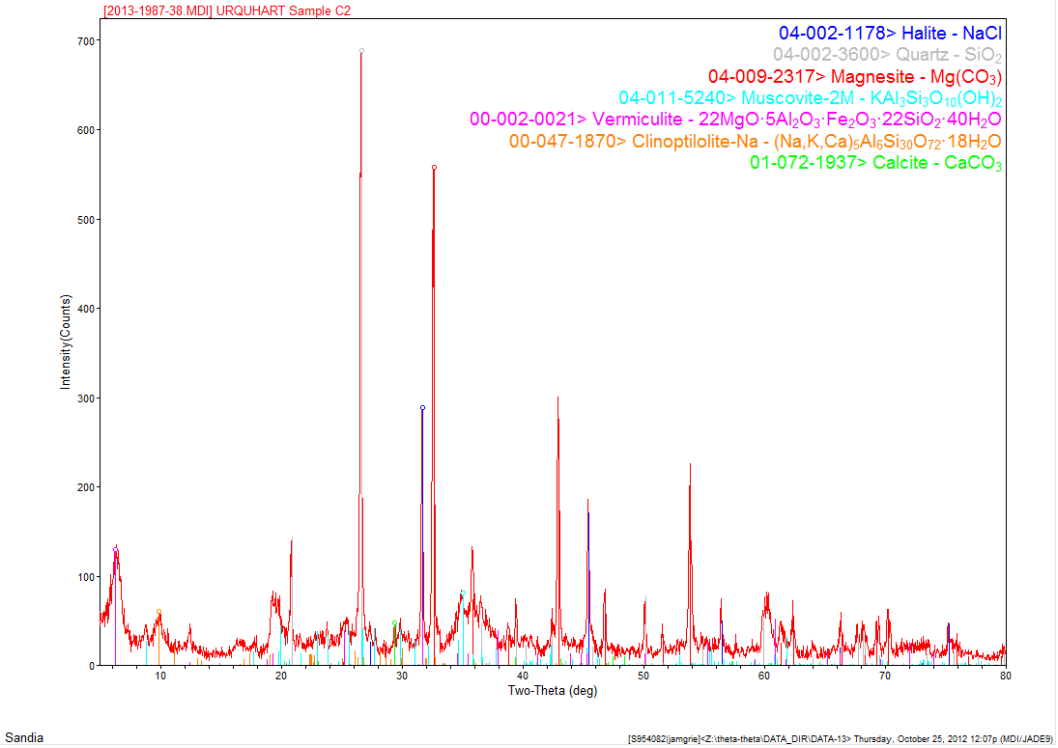
Sample B



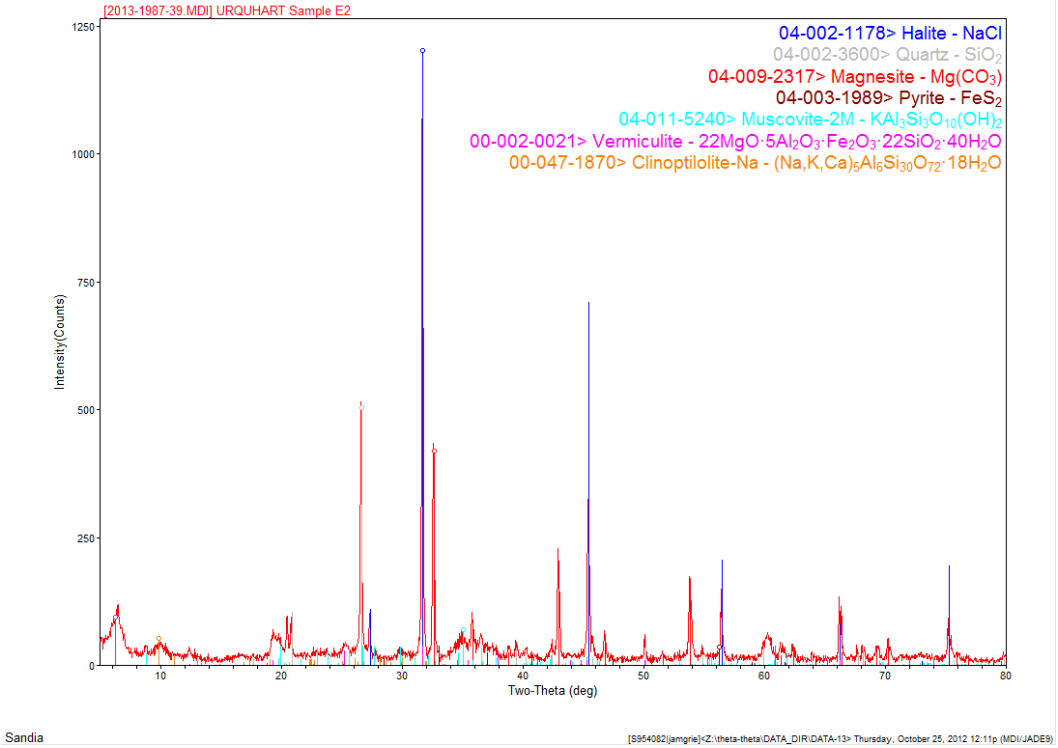
Sample B2



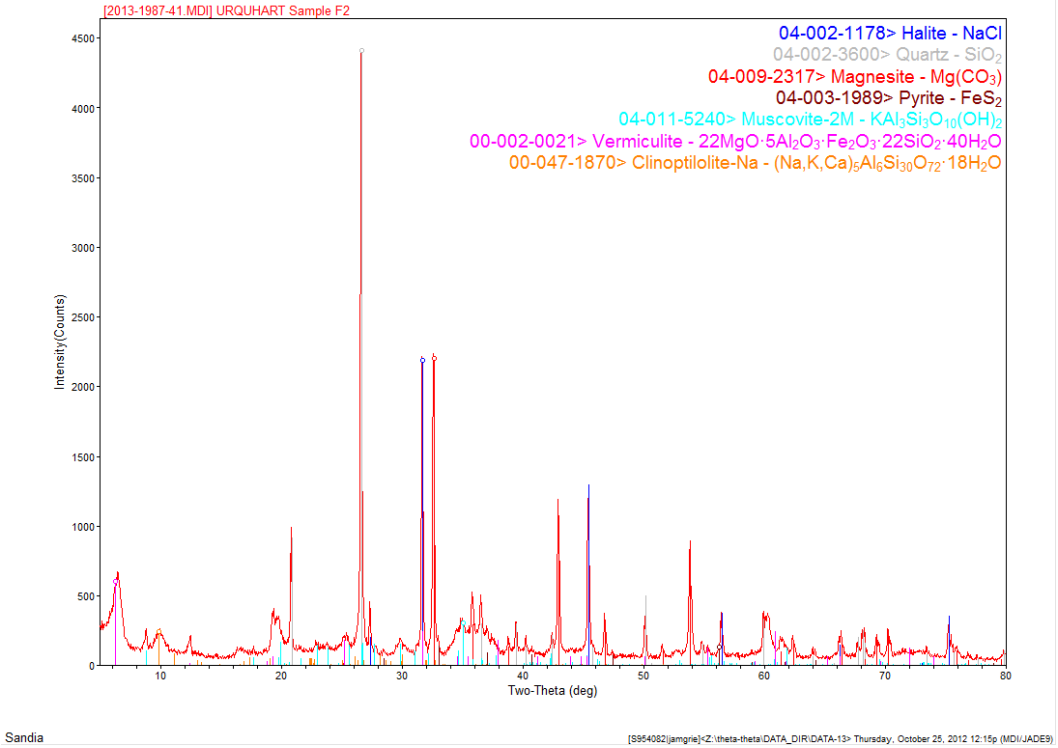
Sample C



Sample C2



Sample E2


[2013-1987-41.MDI] URQUHART Sample F2
04-002-1178> Halite - NaCl
04-002-3600> Quartz - SiO_2
04-009-2317> Magnesite - $Mg(CO_3)$
04-003-1989> Pyrite - FeS_2
04-011-5240> Muscovite-2M - $KAl_3Si_3O_{10}(OH)_2$
00-002-0021> Vermiculite - $22MgO{\cdot}5Al_2O_3{\cdot}Fe_2O_3{\cdot}22SiO_2{\cdot}40H_2O$
00-047-1870> Clinoptilolite-Na - $(Na,K,Ca)_5Al_6Si_{30}O_{72}{\cdot}18H_2O$
Intensity(Counts)
Two-Theta (deg)
Sandia
[S954082|jamgrie]<Z:\theta-theta\DATA_DIR\DATA-13> Thursday, October 25, 2012 12:15p (MDI/JADE9)

Sample F2

APPENDIX 5

PROCEDURE/INSTRUCTIONS FOR PRESSING 25.4-MM-THICK VARIABLE-POROSITY SALT PELLETS

Die dimensions

- Shell: 70.40 mm
- Pusher rod: 75.04 mm
- Base plate: 27.93 mm
- Base plate (narrow portion): 12.93 mm
- Target pellet height: 25.40 mm
- Target extruding piston: 42.97 mm

Load die

- Use only the die shell, base plate, and piston
  - Do not use either of the two additional steel plates
- Load upside down by setting shell on top of supports that allow the piston to intrude part-way into shell
- Pour pre-weighed salt into die
  - There will be natural grain sorting during this process, with finer salt powder settling to what will ultimately be the "bottom" of the pellet
- In order to "un-sort" the salt, hold base plate and pusher rod in place (with base plate up) while swiveling die in circles, using the end of the rod, roughly, as a pivot point

Determine actuator displacement

- Load die to about 250 lbs (in order to create a stable, measurable external length)
- Lift crosshead and measure external length of pusher rod
- [Target actuator displacement] = [external length] – 42.97

Compact pellet

- On 22 kip frame, use "Small die Comp.cfg"
- On 220 kip frame, use "220k Frame Simple Uniax.cfg"
- Make sure that "Small Die Urquhart" procedure is loaded
- In Procedure Editor
  - Set Ramp displacement rate to 0.001 inch/second
  - Set Ramp final displacement to [target actuator displacement] (from above)
  - Set Hold to 15 minutes and "Force Control"
- Lower crosshead/raise actuator until piston just touches crosshead
  - CAUTION: The salt is still highly compressible. Do not preload with more than 10–30 lbs, as doing so will create displacement that will be added at the end of procedure, greatly increasing final compression
- Lock crosshead
- Run displacement-controlled procedure to target actuator displacement
  - When finished, pusher rod should rise 42.97 mm above shell
- When actual displacement reaches target displacement, procedure will hold current load for 15 minutes, allowing pellet to plastically deform
  - Displacement will continue to creep up (by as much as 0.7 mm); this is desirable, as it compensates for post-decompression pellet expansion

Remove pellet smoothly

Distribution:

1 0735 Moo Lee, 6914 (electronic copy)
1 1033 Stephen J. Bauer, 6914 (electronic copy)
1 1033 Scott Broome, 6914 (electronic copy)

1 0899 Technical Library, 9536 (electronic copy)

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