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A Small-Scale Capsule Test for Investigating the Sodium-Carbon Dioxide Reaction

2007. 01

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제 출 문

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본 보고서를 〔액체금속로설계기술개발〕과제중 "소듐기술개발" 과제의 [A Small-Scale Capsule Test for Investigating the Sodium-Carbon Dioxide Interaction Reaction]에 대한 기술보고서로 제출합니다.

2007. 01

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요 약 문

모듈러 소듐-초임계 이산화탄소 열교환기의 이용은 총괄 플랜트 에너지 이용에 있어서 주목할 만한 개선을 이루게 된다. 그러나 이러한 유형의 원자로에서 1차 및 2차 계통 사이에 있는 열교환기의 경계층에서 튜브가 파손되었을 시 발생할 지도 모르는 Na-CO_2 반응의 영향으로 소듐 pool에 있는 고압 CO_2의 blowdown 및 intermixing 현상이 발생할 수 있으며 이로 인한 압력 증가로 열교환기의 구조에 심각한 영향을 미칠 수가 있다. 이용 가능한 데이터에 의하면 소듐과 이산화탄소의 화학반응에 의해 소듐 산화물, 탄산나트륨, 탄소 및 일산화탄소 등이 생성된다고 기록되어 있으나 이러한 거동에 대한 실험과 연구정보는 거의 없는 실정이다. 따라서 압력 영향에 대한 예비평가를 위하여 Na-CO_2 반응에 대한 소규모 실험을 수행하게 되었다. 실험에 사용된 Test Capsule 내의 소듐량은 약 30g이며, 실험조건으로서 온도범위는 200~600℃, CO_2 가스 유량범위는 25~100 scc/min(standard cubic centimeter per minute)이고, 압력범위는 10~40 kg/㎠이다. 실험횟수는 이러한 실험조건 내에서 29회 수행하였다. 실험결과에 의하면 모든 실험조건 하에서 CO_2는 소듐과 반응하였으며, 200℃ 에서는 미약하나마 2회에 걸쳐 반응이 일어났고 300℃ 이상에서는 반응이 현저하게 일어남을 알 수 있었다. 그리고 600℃ 실험에서는 Na-CO_2 반응이 매우 빠르게 일어남을 알 수 있었다.

Abstracts

The utilization of modular sodium-to-supercritical CO_2 heat exchangers may yield significant improvements for an overall plant energy utilization. The consequences of a failure of the sodium CO_2 heat exchanger boundary, however, would involve the blowdown and intermixing of high-pressure CO_2 in a sodium pool, causing a pressurization which may threaten the structural integrity of the heat exchanger. Available data seems to indicate that the chemical reaction between sodium and CO_2 would likely produce sodium oxides, sodium carbonate, carbon and carbon monoxide. Information on the kinetics of the sodium-CO_2 reaction is virtually non-existent. A small-scale capsule test has been conducted at KAERI to explore the basic nature and extent of the sodium-CO_2 chemical reaction, for a preliminary assessment of the pressurization issue. The experimental study was carried out by using an experimental apparatus for about 30g of sodium. A number of experiments were carried out with the sodium temperature ranging from 200℃ up to 600℃, with an operating pressure of up to 40 kg/cm^2. The results show that the carbon dioxide reacted readily with the liquid sodium under the experimental conditions. It seems that the interaction reaction of Na-CO_2 was slow at 200℃ and became faster above 300℃. The reaction phenomena of 300℃ and 400℃ were similar. At 600℃ the reaction of Na-CO_2 occurred very rapidly.

Contents

Tables

Figures

1.0 Background and Introduction

1.1 Background

This report is summarized on the chemical reaction test performed as a task of International Nuclear Energy Research Initiative (INERI) program collaborated with the Argonne National Laboratory (ANL), U.S.

The metal-fueled, sodium-cooled fast reactor system is expected to accommodate all credible malfunctions or accident initiators passively without damage to the core. However, the evaluation of the safety performance and the containment requirements for this system will most likely require consideration of postulated low-probability accident sequences that result in partial or whole core melting. For these sequences, some phenomenological uncertainties exist and experimental data are needed for modeling purposes. One such data need is concerned with the potential for freezing and plugging of molten metallic fuel in above-and below-core structures and possibly in inter-subassembly spaces. An important issue here is the quantity of fuel removed from the core region to assure sub-criticality. The first task activity addressing the data need is to develop a test plan for the determination of liquids/solidus and mobilization temperature for fuel/steel mixtures. This task activity (Task No. 4.1) was completed in 2003 and documented in Ref. 1. The second task activity addressing the data need is to develop a test plan for investigations of the relocation and freezing behavior of molten metallic fuel in coolant channels, including possible chemical interactions of molten fuel with the channel steel structure. This task activity (Task No. 4.2) has been completed. It may be noted that the chemical interaction test described in this test plan is sufficiently comprehensive to address a key issue for in-vessel retention strategies, namely the ability of steel structures to contain molten fuel/ steel melts for a long period of time.

1.2 Introduction

This study was performed to provide baseline data on the sodium-carbon dioxide ($Na-CO_2$) reaction. A small-scale capsule test has been conducted to explore the basic nature and extent of the $Na-CO_2$ chemical reaction. The capsule test will provide information for a preliminary assessment of the pressurization issue for a failure of the sodium and carbon dioxide heat exchanger boundary.

A number of experiments were carried out with the sodium temperature ranging from 200℃ up to 600℃, with an operating pressure of up to 40 kg/cm^2, and with a changing flow rate from 25 scc/min to 100 scc/min. Four batches of experiments were performed based on the temperatures of 200, 300, 400 and 600℃ in this study. Batch means a change of the test capsule; after one batch, the test capsule should be taken out for an analysis of the solid products. The amount of the sodium used for one batch was about 30g. All of the thermal data, pressure data and mass flow rate data were recorded on-line in the DAS (Data Acquisition System). Quantitative analysis of the gas sample was carried out on-line for five minutes by a Gas Chromatograph (GC) for each initial pressure condition. The quantitative as well as qualitative analyses of the solid sample were carried out by an acid-base titration, X-ray diffraction (XRD) and Electron probe micro-analysis (EPMA).

2.0 Sodium-Carbon Dioxide Reaction Test

2.1 Test Objectives

Investigate the basic nature and extent of the sodium-CO_2 chemical reaction between sodium and CO_2, for a preliminary assessment of the pressurization issue. More specifically investigation should be made to,

- first to observe if there are chemical reactions or not between them,
- then identify specific reactions and their products of gas or solid,

· and further to determine their reaction rates.

2.2 Test Data Required

For each test measured data are required for

1) sodium temperature history
2) pressure and temperature changes in time in the gaseous space
3) composition change of gaseous products by on-line gas sampling
4) post test analysis of frozen sodium to determine compositions of solid products

2.3 Test Variables and Ranges

The major test variables of the tests are the temperature and pressure on time. For the range of these variables in the tests, the $Na-CO_2$ reaction mechanism should be considered. The temperature on time at each pressure will be measured to confirm the phenomena in the different pressure conditions.

Initial test conditions or ranges of test variables are,

1) sodium temperature : 200~600℃ (based on reactor condition)
2) sodium and test section pressure : atmospheric pressure (based on reactor condition)
3) sodium mass : 30g
4) CO_2 mass : moles equal to that of sodium
5) CO_2 injection pressure : arbitrarily taken (not too high to avoid the risk)

2.4 Test Apparatus

2.4.1 Test Facility Configuration

As shown in Figure 1 and 2, the test apparatus consists of a test capsule and associated components: sodium storage tank, vapor trap, gas supply system, instrumentation and gas sampling system.

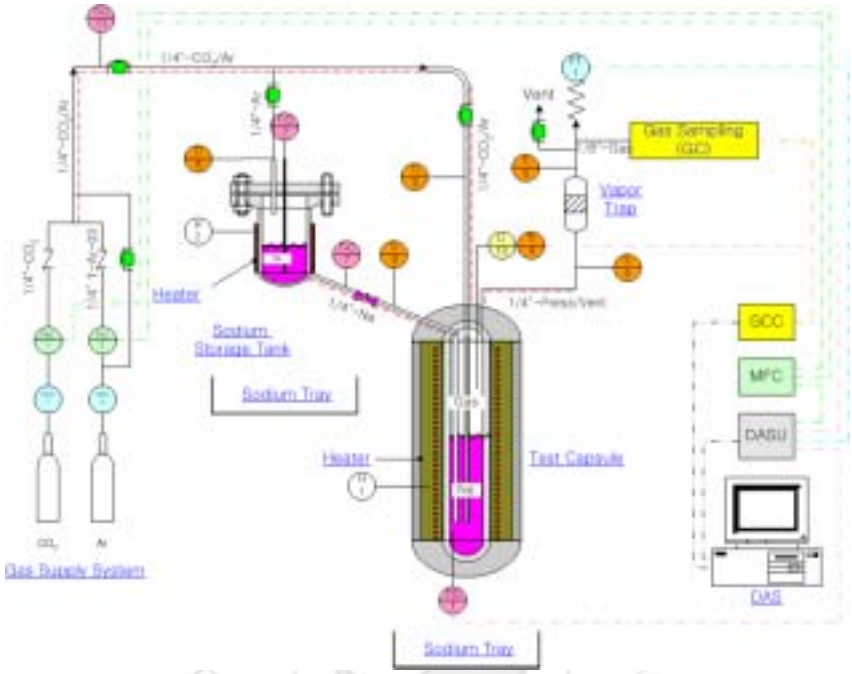


Figure 1. Flow diagram of the capsule test.

Figure 2. Photo of the capsule test facility.

Sodium Storage Tank

The sodium storage tank (Figure 3) is used to store enough liquid sodium (about 300 g) for several experiments (batches). It is 120 mm tall with a 2-1/2 inch diameter (schedule 40) stainless steel 304 pipe. The solid sodium ingot is put into the tank after measuring the weight in the glove box in the argon atmosphere. A band heater was installed outside the sodium storage tank and the sodium was heated about 200℃. The power of heater is 220V, 1ph, 0.5 kW, and its dimension is 76.3(1½", O.D)×90mm(L).

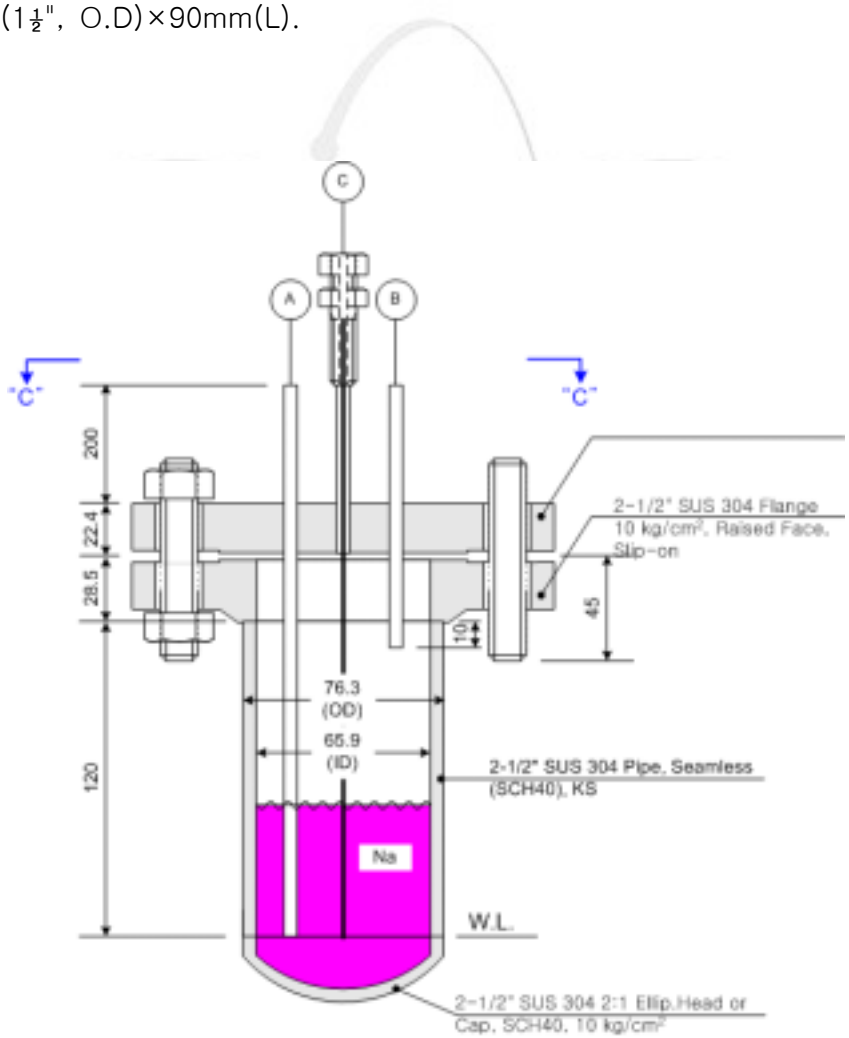
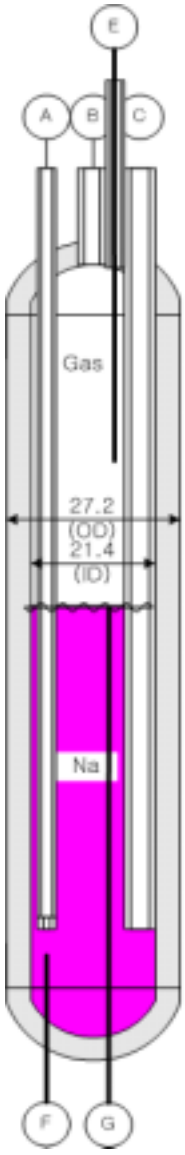


Figure 3. Schematic diagram of the sodium storage tank.

Test Section (Capsule)

The test capsule is 240 mm tall with a 3/4 inch diameter40) stainless steel 304 pipe, as shown in Figure 4. It is equipped with a gas injection, a sodium feeding line and an exhaust line. The height of the sodium pool will be about 100 mm, corresponding to a sodium mass of 30g. A mantle-type heater was installed outside the test capsule. About 1.6 kW of power was required to heat the sodium to 600℃.



Nozzle & Opening Schedule					
Mark	Type	Size	No.	Service	Remark
A	Tube	1/8"	1	CO_2	SUS 304
B	Tube	1/4"	1	Pressure/Vent/ Gas sampling	SUS 304
C	Tube	1/4"	1	Sodium	SUS 304
E	Tube	1/4"	1	TI-4	Tube & TC Fitting
F	Tube	1/4"	1	TIC-1	Tube & TC Fitting
G	Tube	1/4"	1	LI-10	Tube & TC Fitting

Figure 4. Schematic diagram of the test capsule.

Vapor Trap

A vapor trap is installed at the downstream of the test capsule to collect fumes by the Na-CO_2 reaction and to prevent from intrusion of the fumes into the pressure sensor and gas analyzer. The vapor trap is 40 mm tall with a 3/4 inch diameter40) stainless steel 304 pipe, as shown in Figure 5. Inside the trap, five folded stainless wire mesh is installed.

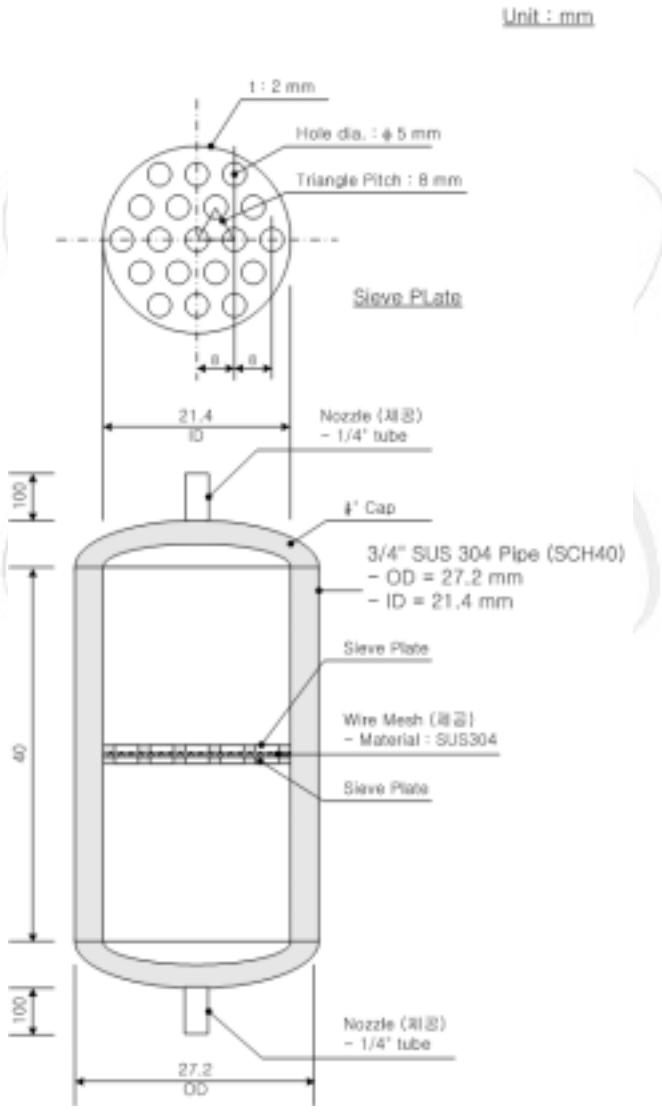


Figure 5. Schematic diagram of the vapor trap.

Gas Supply Systems

In the Gas Supply System, there are three kinds of gas system. Nitrogen gas is used to feed the sodium into the Sodium Storage Tank by pressure. Argon gas is used for calibration test before testing with CO_2 gas test. The purity of the argon gas is 99.999%. CO_2 gas is used for the main test. The purity of CO_2 99.99%. The water content in the CO_2 gas is less than 9 ppm. For the calibration of the GC, standard gas (CO; 1, CO_2; 5 mol%/mol) was used.

2.4.2 Measurements

Temperature

The test capsule is instrumented with an array of thermocouples along its length, inserted through the top and bottom flanges. Thermocouples measure the temperature in the sodium pool and the gaseous space. Thermocouples for the thermometry are K type with a 1/16 inch sheath outer diameter. The configuration of the temperature controllers and indicators is as shown in Table 1.

Table 1. Temperature Controllers and Indicators

	Name	Tag No.	Location	Fluid	Temp. (℃)
Controller	Capsule heater	TIC-1	Test capsule	Na	200~700
	Sodium storage tank heater	TIC-2	Sodium storage tank	Na	150~200
	Sodium line heater	TIC-7	1/4" T-Na-01 (Na valve upstream)	Na	150~200
	Gas line heater	TIC-11	1/4" T-CO_2/Ar-04 (Gas)	Ar/CO_2	200
Indicator	Capsule gas temperature	TI-4	Test capsule top	Ar/CO_2(CO)	200~700
	Line heater-1	TI-3	1/8" T-CO_2/Ar-05	Ar/CO_2	200
	Line heater-2	TI-5	1/4" T-Press/Vent-08 (VT upstream)	Ar/CO_2(CO)	200~700
	Line heater-3	TI-6	T-Press/Vent-08 (VT downstream)	Ar/CO_2(CO)	200~700
	Line heater-4	TI-8	Na Tank Ar gas in	Ar	-
	Line heater-5	TI-9	1/4" T-Na-01 (Na valve downstream)	Na	150~200

Pressure

The pressure in the gaseous space above the sodium is monitored by a pressure sensor (Sensys, Model; PMHA) installed on the downstream of the vapor trap. The figure and specification of the pressure sensor is as shown in Figure 6 and Table 2. The calibration curve of the pressure sensor is illustrated in Figure 7.

Figure 6. Photo of the pressure sensor.

Table 2. The Specification of the Pressure Sensor.

Model	Range	Accuracy	Operating Temp	Out put	Material
PMHA 0100KAAA	0-100 kg/㎠	±0.25% FS ±0.7%FS: 5 kg/㎠	-30℃~100℃	0-5 VDC	STS 630

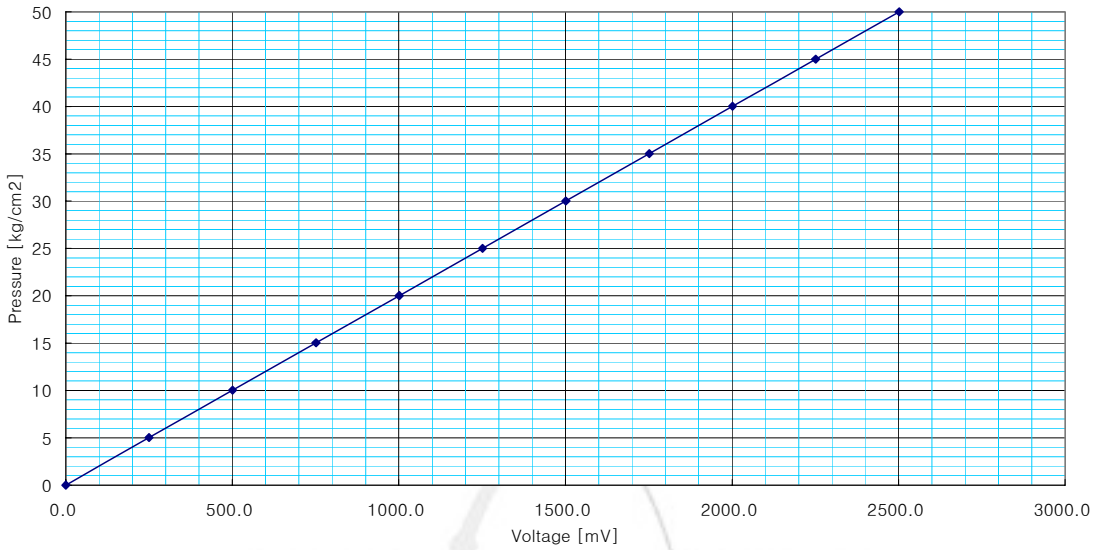


Figure 7. Calibration curve of the pressure sensor.

Gas Mass Flow

Two mass flow meters measure the gas injection rate of the Ar and CO_2 gas as a function of the time. The figures and specification of the MFC and Read Out Unit are as shown in Figure 8, 9 and Table 3, and the calibration curve of it was illustrated in Figure 10. The flow range of the mass flow meters is from 0 to 100 scc/min. Gas is injected through the 1/4" tube with an end tapped nozzle of 1 mm in diameter inserted in the test capsule.

Figure 8. Photo of the mass flow meters (Ar, CO_2).

Figure 9. Photo of the MFC Read Out Unit.

Table 3. The Specification of the MFC.

Power	Accuracy	Temperature Coefficient	Gas Pressure	Gas Ambient Temperature	Output Signals
12VDC, 24VDC	±1.5% Full scale	0.15% of full scale/℃.	10 MPa (max.)	32 to 122°F (0 to 50℃)	0-5 VAC, 4-20 mA

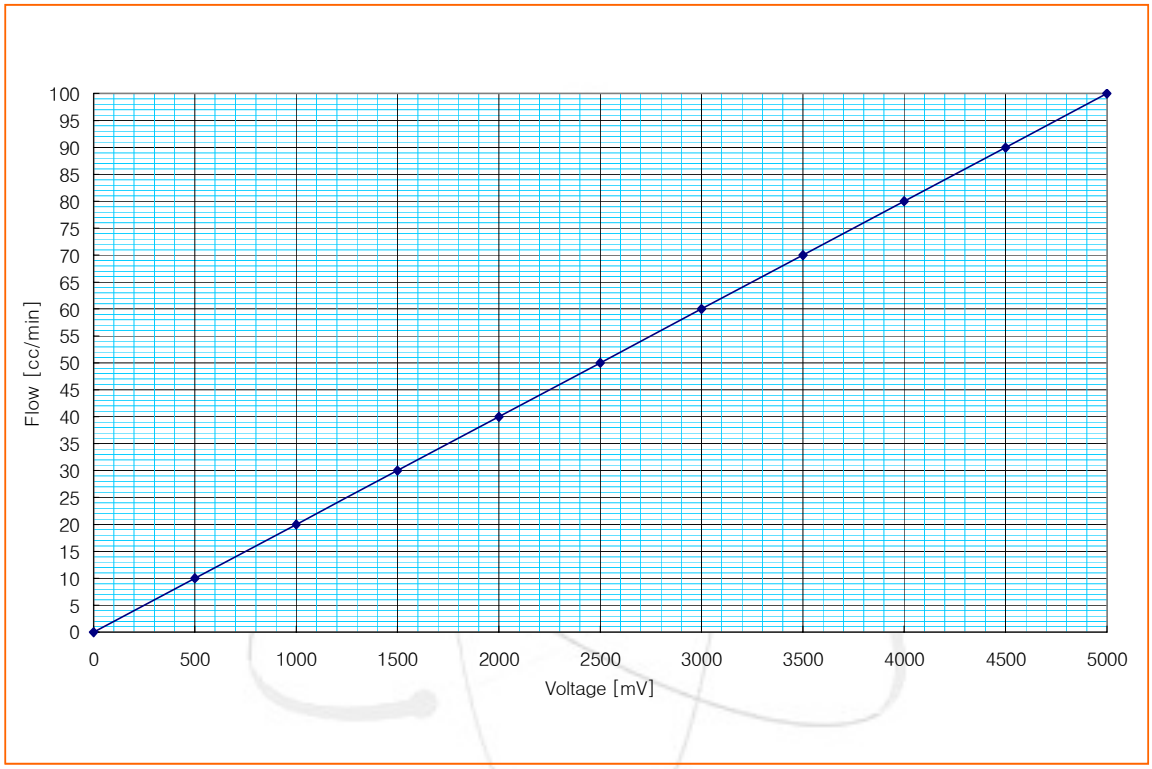


Figure 10. Calibration curve of the MFC.

Gas Product Analysis

The exhaust gas from a downstream side of the vapor trap is analyzed by a GC after every experimental case. Quantitative analysis of the gas sample was carried out on-line for five minutes by a Gas Chromatograph (GC; Model: HP 5890, Packard Series II)) for each initial pressure condition. The figure of the GC is illustrated in Figure 11. The purity of CO_2 and argon gas is 99.99 and 99.999%. The water content in the CO_2 gas is less than 9 ppm. For the calibration of the

GC, standard gas (CO; 1, CO_2; 5 mol%/mol) was used and the calibration data and figures are shown in Table 4 and Figures 12 and 13.

Figure 11. Photo of the gas chromatograph (GC).

Table 4. The Calibration Data of the GC.

Data Name	CO	CO2	Remark
HS Cal-Std1-(1)	0.43/(0.46)	1.25	CO peak : higher than others
HS Cal-Std1-(2)	0.46	1.26	
HS Cal-Std1-(3)	0.46	1.26	
HS Cal-Std1-(4)	0.46	1.26	
HS Cal-Std2-(1)	0.46	1.20	CO, CO2 peak : cut
LS Cal-Std1-(1)	0.47	1.26	CO, CO2 peak : too small
LS Cal-Std1-(2)	0.37/0.47	1.26	one peak appeared before CO peak
LS Cal-Std1-(3)	0.47	1.26	CO, CO2 peak : too small
LS Cal-Std1-(4)	0.47	1.26	"
LS Cal-Std2-(1)	-	1.20	
LS Cal-Std2-(2)	0.46	1.21	
LS Cal-Std2-(3)	-	1.21	
LS Cal-Std3-(1)	-	1.09	CO, CO2 peak : cut
LS Cal-Ar-(1)	0.43	-	Ar peak : cut

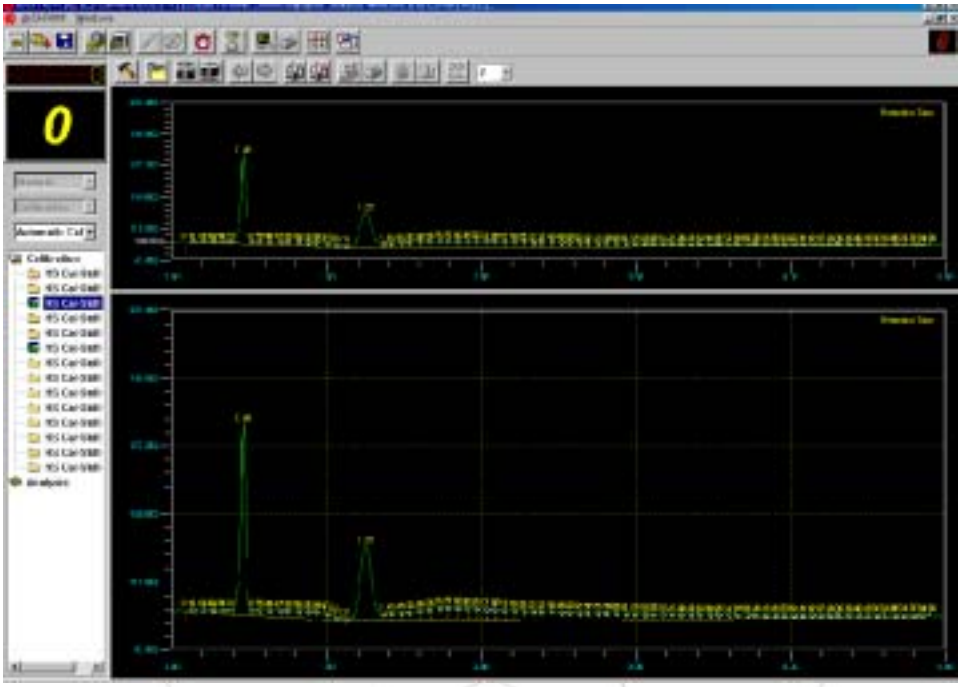


Figure 12. The calibration chart of the high sensor with the standard gas (CO; 1, CO_2; 5 mol%/mol).

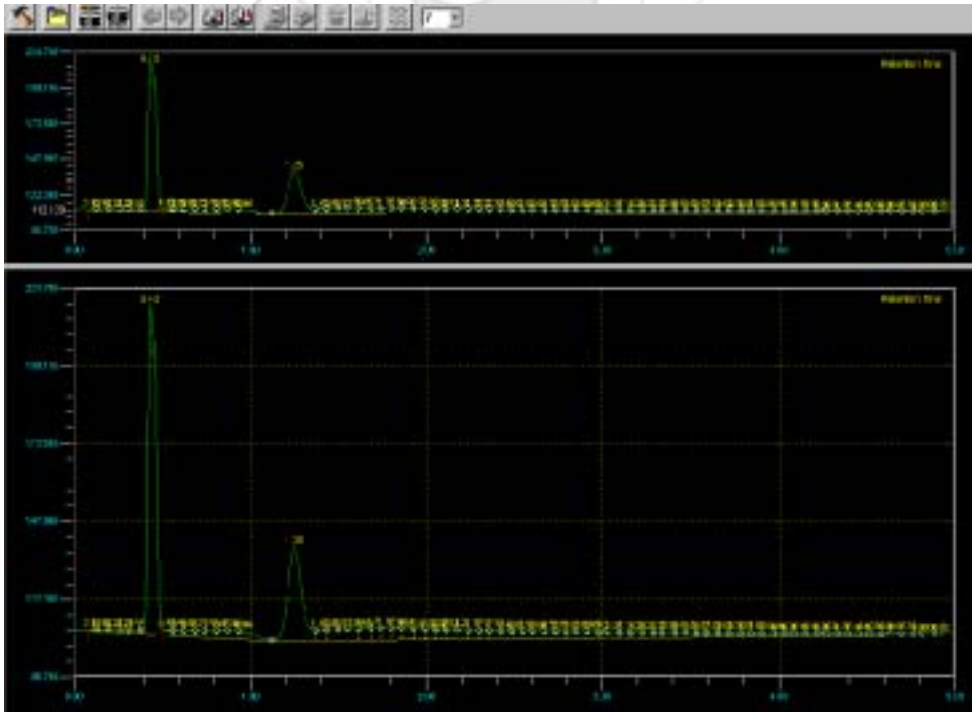


Figure 13. The calibration chart of the low sensor with the standard gas (CO; 1, CO_2; 5 mol%/mol).

Control Panel

On the control panel, three temperature controllers and two temperature indicators and one pressure indicator as shown in Figure 14. Three temperature controllers are for the sodium storage tank heater, test capsule heater and two pipe band heaters, two temperature indicators having multi-buttons indicates six positions. The pressure indicator indicates the gas pressure in the test capsule.

Figure 14. Photo of the control panel.

2.4.3 Post Test Analysis

Sampling of solid products was carried out after every batch based on temperature. The test capsule was taken out for an analysis of the solid products. The quantitative as well as qualitative analyses of the solid sample were carried out by an acid-base titration, X-ray diffraction (XRD) and Electron probe micro-analysis (EPMA). The

chemical analysis of the solid products was performed by the team in Chemical Analysis and Test Division in KAERI.

2.5 Test Procedure

The sodium in the sodium storage tank is melted and transferred to the test capsule. When the desired mass of sodium is transferred and the buzzer alarms, as indicated by the level probe in the test capsule, the valve on the sodium transfer line is closed. The sodium in the test capsule is further heated to the desired temperature with keeping the gas temperature at 200℃. When the desired temperature is reached, the gas flow rate is pre-set by turning a dial on the MFC (Mass Flow Controller) Read Out Unit. And then, the gas is injected by opening the valve slowly to the initial pressure condition with the exhaust valve open. At this time, one should be careful not to overflow the sodium to other lines and equipments. Then the exhaust valve is closed and get the data with a Data Acquisition & Switch Unit. When sodium carbonates may form and plug up the gas injection nozzle or when the sodium temperature change observed is considered sufficiently significant, terminate the test. After a data acquisition of one case experiment, the data logging is stopped and the GC inlet valve is opened to analyze the cover gas sample for five minutes. During this time the gas is vented through the GC. The experiment is repeated for next case. After finishing one batch of experiments under the same temperature, the heater is turned-off and the test capsule is taken out to analyze the solid product. And then, a new test capsule is installed and the heater is turned-on for the next batch of experiments.

2.6 Test Matrix

Experiments with CO_2 were carried out for twenty nine cases as shown in the Table 5, with the sodium temperature ranging from 200℃ up to 600℃, with an operating pressure of up to 40 kg/㎠, and with a

changing flow rate from 25 scc/min to 100 scc/min. Four batches of experiments were performed on the temperatures of 200, 300, 400 and 600℃. The maximum pressure of 40 kg/㎠ was based on the gas supply bottle pressure in the winter season. The ventilation time of the exhaust gas was about five minutes for the gas analysis in the GC after each case of experiments.

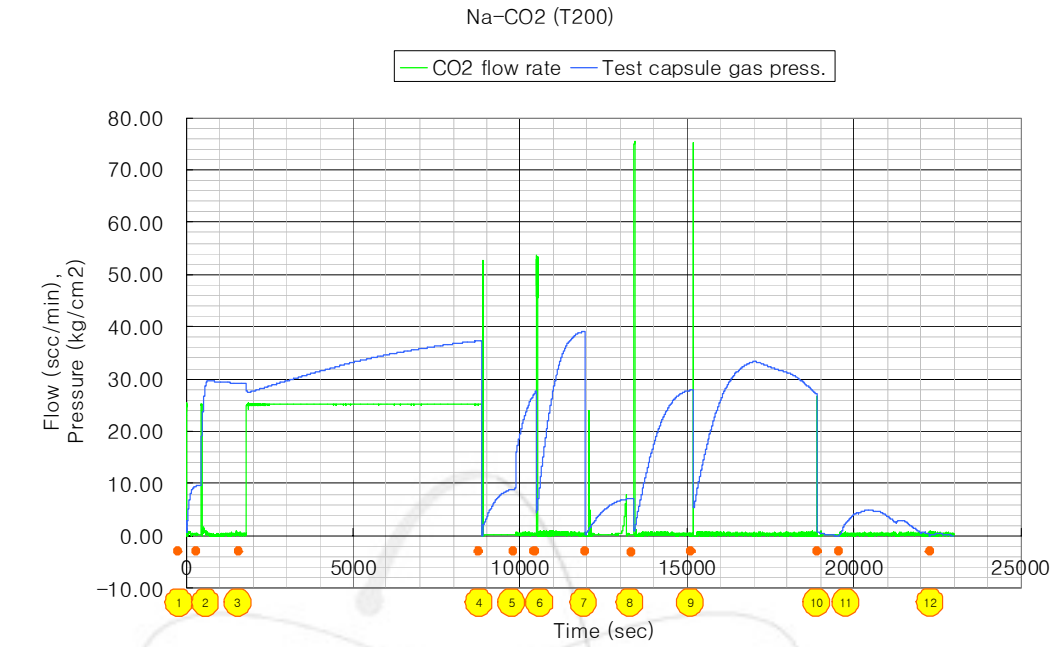
Table 5. Test Matrix.

Case No.	Temperature (℃)	Gas Flow Rate (scc/min)	Gas Supply Bottle Pressure (kg/㎠)	Period (min)
1	200	25	10	7.2
2			30	22.9
3			40	117.7
4		50	10	16.7
5			30	10.4
6			40	24.3
7		75	10	24.3
8			30	29.4
9			40	61.7
10		100	10	11.2
11			30	44.5
12			40	12.4
13	300	25	10	29.4
14			30	33.8
15			40	20.1
16		50	40	20.0
17		75	40	20.1
18		100	40	19.8
19	400	25	10	70.8
20			30	27.4
21			40	22.8
22		50	40	20.4
23		75	40	20.3
24		100	40	21.1
25	600	25	10	21.9
26			30	55.5
27		50	30	21.7
28		75	40	20.6
29		100	40	20.8

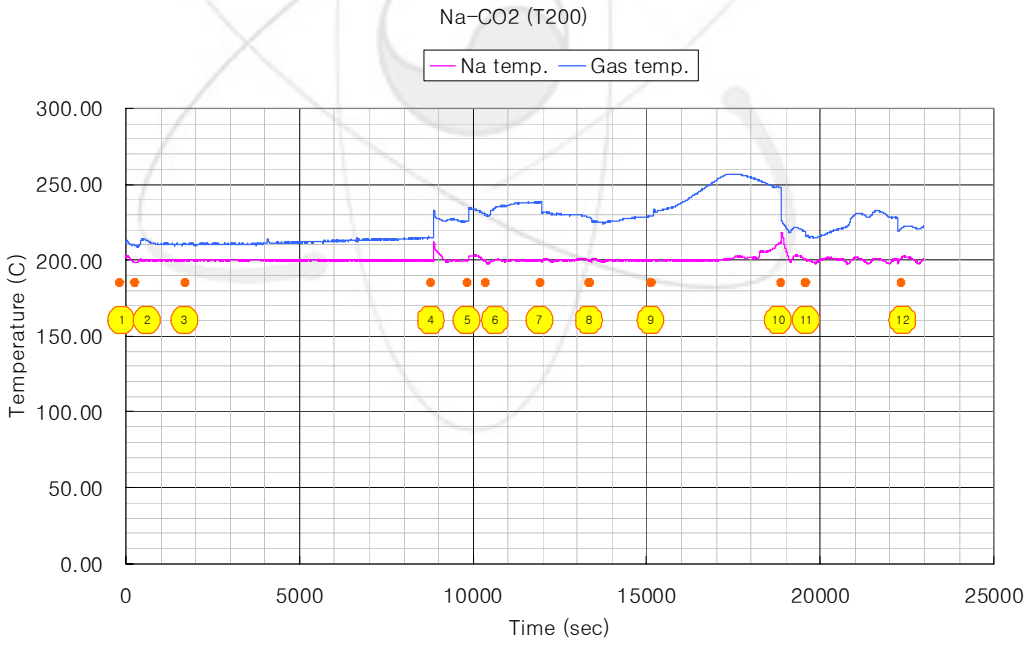
3.0 Results and Discussion

Figures 15 to 18 show the results of the interaction reaction between sodium and CO_2 at each temperature of 200, 300, 400 and 600℃ respectively. Numbers in the yellow circles are the experimental case numbers.

As shown in Figure 15, twelve cases experiments at the sodium temperature of 200℃ were performed with an operating pressure of up to 40 kg/㎠, and with a changing flow rate from 25 to 100 scc/min. In case-1 and -2 of Figure 15(a), a little amount of the gas was supplied as a spike in a few seconds, and then it went to almost zero except the case-3. This is because the test capsule pressure reached to the gas supply bottle pressure as soon as the gas is injected, and the differential pressure (DP_1) of these two pressures was less than the differential pressure (DP_2 : 3 kg/㎠) of the gas mass flow meter. In case-3, the set flow rate of the gas, 25 scc/min was injected into the test capsule as DP_1 was kept above the DP_2. In the beginning of case-4 (flow rate; 50 scc/min, pressure; 10 kg/㎠), 150 minutes after a gas injection with an increasing flow rate and pressure, the first temperature variation was observed: the sodium and gas temperature was raised, and the pressure increased slowly for all that the gas flow rate was near to zero which may be caused by a plugging of the gas nozzle (1 mm) by the sodium carbonate. This seems to be the first reaction. The accumulated amount of the CO_2 till 150 minutes after gas injection was about 3000 scc. And then another temperature variation supposed to be the second reaction was observed 150 minutes after the first temperature variation in case-9 (flow rate; 75 scc/min, pressure; 40 kg/㎠). At this time also, the sodium and gas temperature was raised, and the pressure increased slowly. Each reaction continued for about 25 minutes. The temperature variation in the sodium pool during this period was very small, and the maximum temperature was 212 and 218℃, respectively.



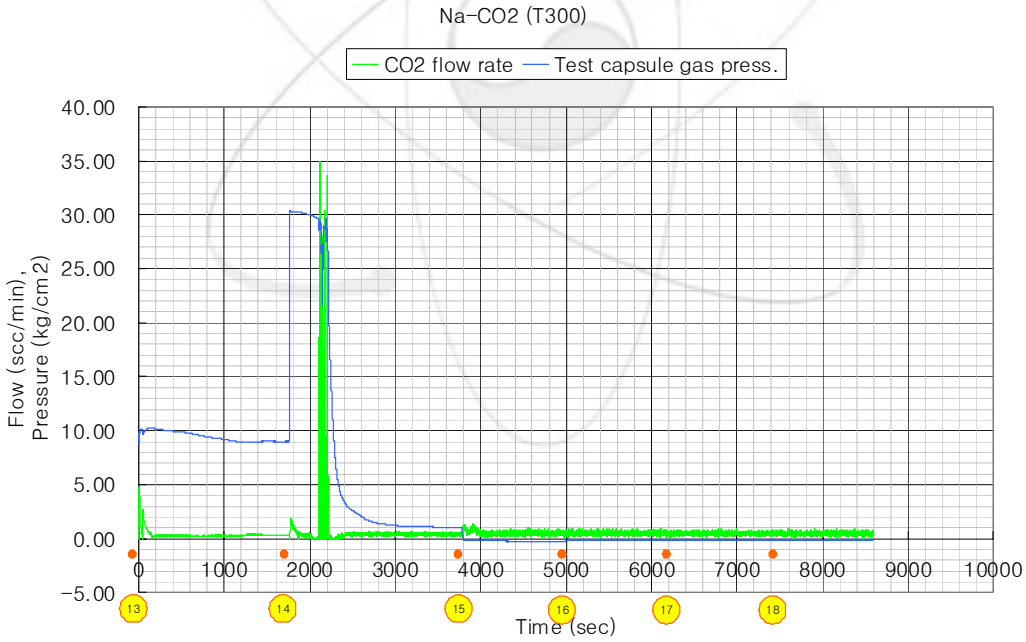
(a)



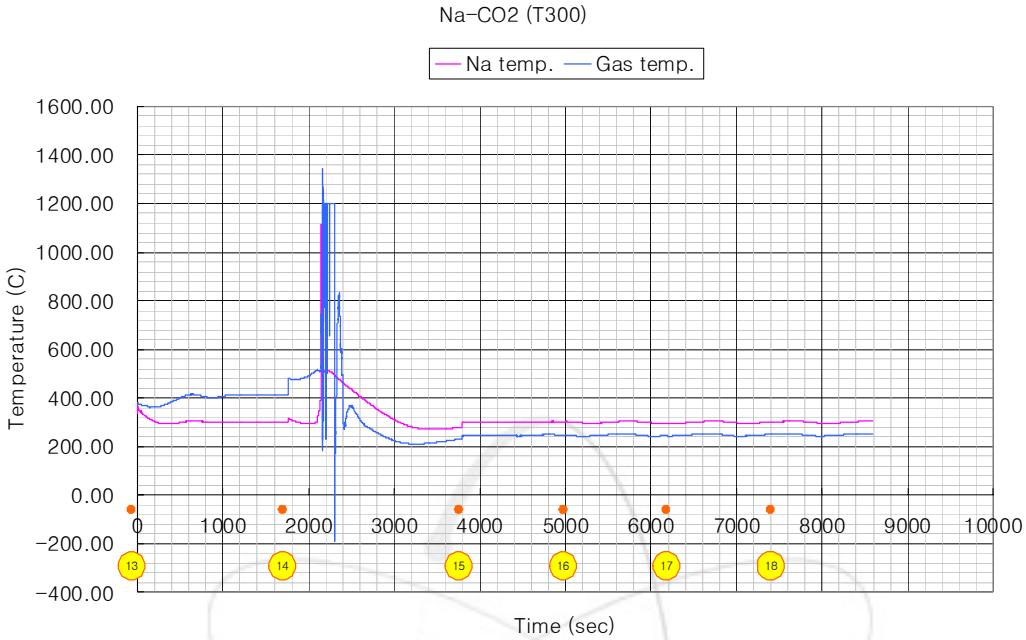
(b)

Figure 15. (a) Flow-pressure data and (b) Thermometry data at 200℃ with CO_2 (Case No. : 1~12).

Figure 16 shows the experimental data at the sodium temperature of 300℃. In case-14 experiment (flow-rate; 25 scc/min, pressure; 30 kg/㎠), a violent temperature variation occurred for a few seconds, 35 minutes after a gas injection. At this time the temperature fluctuated very fast with a maximum sodium temperature of 1110℃ and the thermocouple measuring the gas zone failed for about 3 minutes and then it re-operated, and the body of the test capsule became red-hot. The pressure decreased slowly for about five minutes and then it showed a sharp fall with a fluctuation of the temperature and the gas flow rate. Due to the plugging of the gas injection nozzle, the gas was fed no more and the pressure was maintained near zero. The accumulated amount of the CO_2 till 35 minutes after a gas injection was about 16 scc.



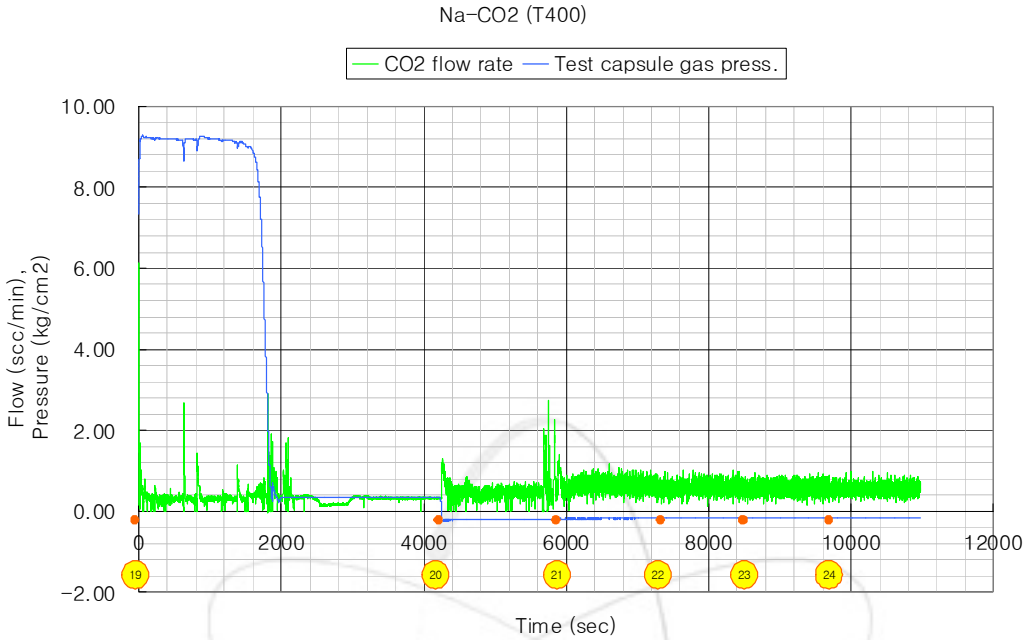
(a)



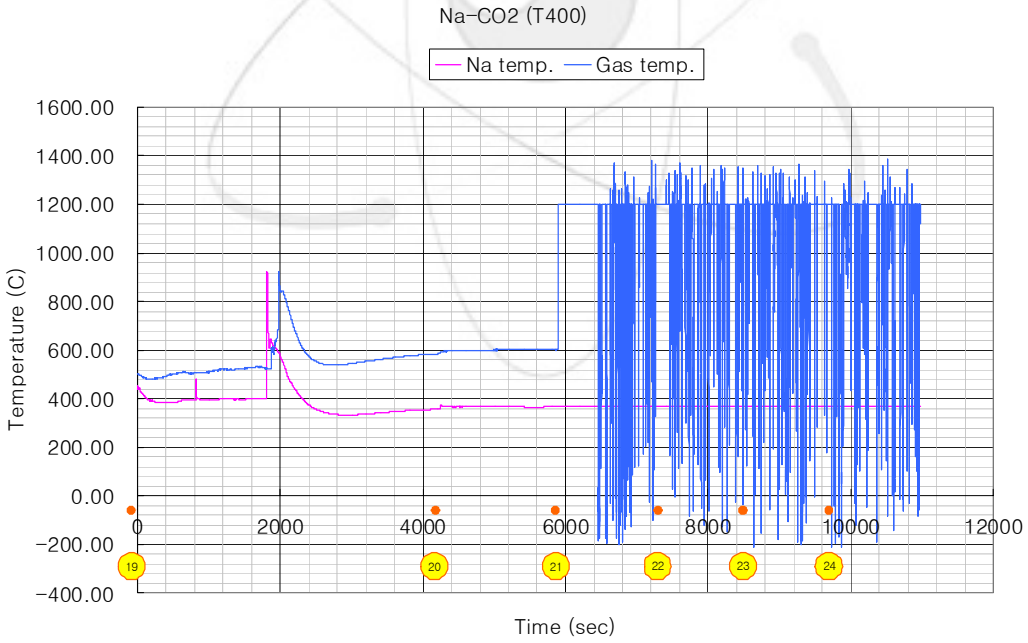
(b)

Figure 16. (a) Flow-pressure data and (b) Thermometry data at 300℃ with CO_2 (Case No. : 13~18).

The phenomena at the sodium temperature of 400℃ were similar to those observed at 300℃ as shown in Figure 17. Before a great change of the temperature, the sodium temperature was maintained as 300℃ and the pressure decreased slowly from 9.29 to 8.90 kg/㎠ for about 27 minutes following a sharp fall to about 0.19 kg/㎠ for about 3 minutes after a gas injection, and then a violent temperature variation occurred for about 150 seconds (case-19, flow-rate; 25 scc/min, pressure; 10 kg/㎠). At this time the maximum temperature of sodium was 923℃ and the thermocouple measuring the gas zone was failed out and then did not re-operate. The fluctuation of the temperature was no severe than the fluctuation at 300℃. The accumulated amount of CO_2 till 27 minutes after a gas injection was about 12 scc. At this time also, the body of the test capsule became red-hot.



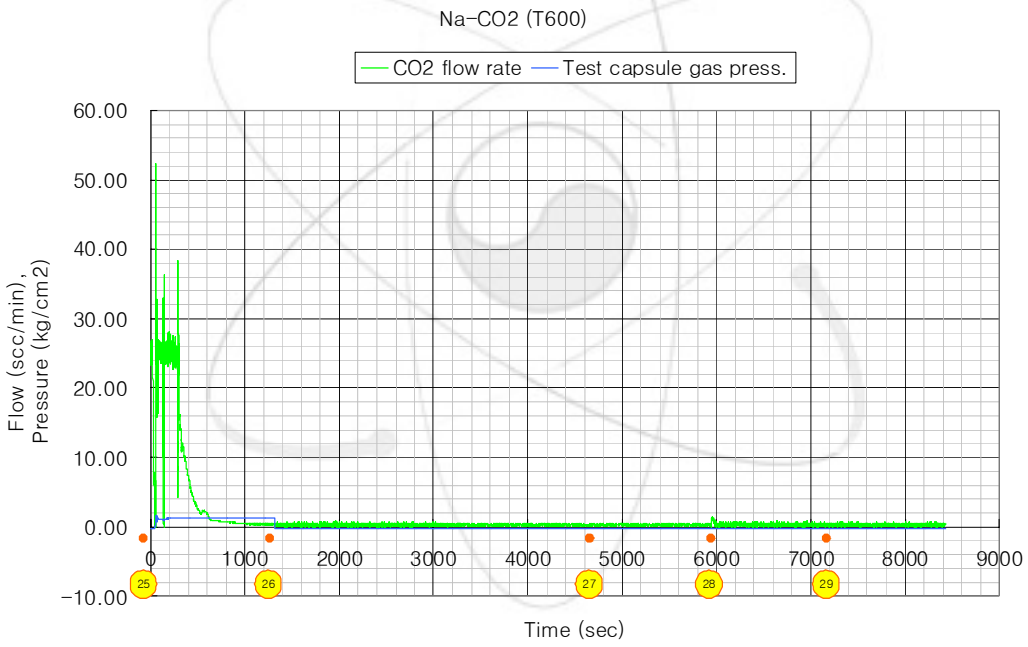
(a)



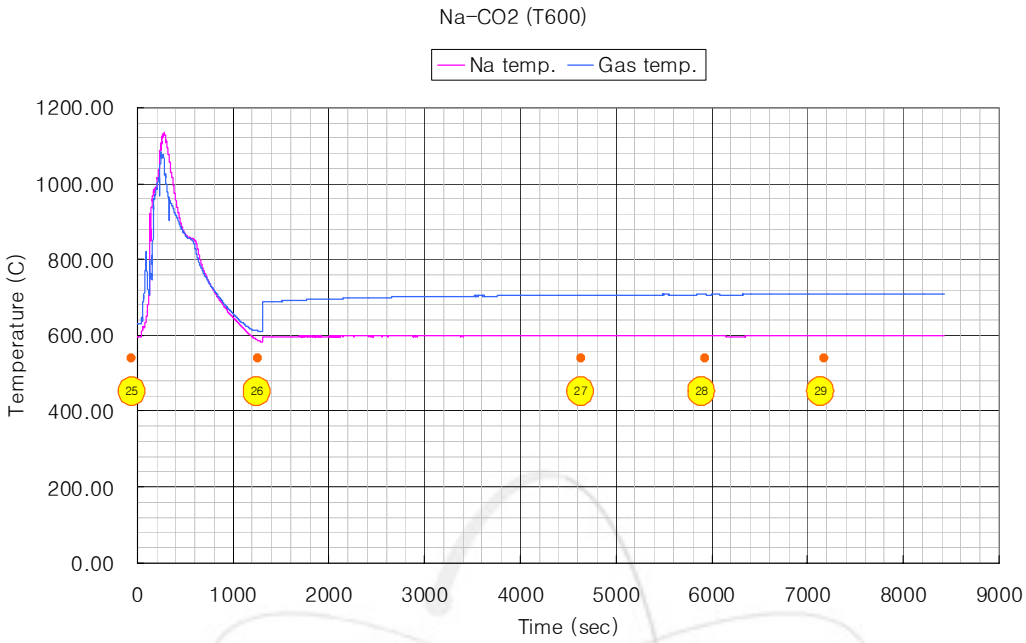
(b)

Figure 17. (a) Flow-pressure data and (b) Thermometry data at 400℃ with CO_2 (Case No. : 19~24).

Figure 18 shows the experimental data at the sodium temperature of 600℃. In this experiment, as soon as a gas feeding started, a violent temperature variation occurred and it continued for about 8 minutes. At this time the temperature increased from 600 to 1130℃ for 4.4 minutes and decreased to 580℃ for about 17 minutes without a temperature fluctuation. The pressure was kept near to 1.3 kg/㎠ from the beginning of the gas injection due to a plugging of the gas nozzle by the reaction product, sodium carbonate (Na_2CO_3). The accumulated amount of CO_2 till 35 minutes after a gas injection was about 148 scc. The thermocouple measuring the gas zone did not fail. The body of the test capsule became red-hot.



(a)



(b)

Figure 18. (a) Flow-pressure data and (b) Thermometry data at 600℃ with CO_2 (Case No. : 25~29).

In reference [1], it is stated that F. Beguin et R. Setton have analyzed in greater detail the reactions involved with all the alkalines. The reaction is at first slow up to 200℃. At about 220℃ it accelerates; and at 260℃ it is reported to be almost complete after several hours. In the experiment of the different contact modes with this experiment, H. Ishikawa, S. Miyahara and Y. Yoshizawa [2] have studied a CO_2 gas bubbling through a sodium pool. They observed the following results : below 873 K, CO_2 reacted in the first few seconds then the reaction was stopped. When the initial temperature was higher than 888 K, the reaction occurred continuously.

Quantitative analysis of the gas sample was carried out on-line for five minutes by a Gas Chromatograph (GC) after each set of pressure experiments (29 cases). Before the analysis, the GC was calibrated with a standard gas (CO; 1, CO_2 5 mol%/mol).

As shown in Table 6, carbon monoxide (CO) exists in all the gas samples and the concentration of the carbon monoxide increased remarkably as the sodium temperature increased.

Before the analysis of the solid products, a sample extraction from the test capsule was performed in a glove box in an argon gas atmosphere. Figure 19 shows a black-color product with a partly white product. The white-color product seems to be un-reacted sodium. Sizes of the samples were about 5 mm, and a photo of the sample bottle is shown in Figure 20. The analyses of the solid products were performed by XRD and an acid-base titration. As a result of the qualitative analysis by XRD, Na (or Na_2O) and Na_2CO_3 were found as can be seen in Figure 21. Red-color peaks indicate the sodium components and blue-color peaks indicate sodium carbonates. For a quantitative analysis, an acid-base titration was carried out. The titration curve of a dissolved sample in 0.1M HCl is shown in Figure 22. The sample is the reacted products of the Na-CO_2 reaction at the temperature of 200℃. The curve of (a) graph is the titration results of the pH adjustment. 0.1M HCl was used as the neutralizing agent. The numeral is the accumulated added volume of 0.1M HCl per sample weight. The curve is classified into three regions of A, B, and C. Sections A, B, and C are the regions producing sodium hydroxide (NaOH), sodium carbonate (Na_2CO_3) and sodium bicarbonate ($NaHCO_3$), respectively. The chemical reaction and ionic equation in each region is as follows:

- A region : $NaOH + HCl \rightarrow H_2O + NaCl$
  $OH^- + H^+ \rightarrow H_2O$
- B region : $Na_2CO_3 + HCl \rightarrow NaHCO_3 + NaCl$
  $CO_3^{2-} + H^+ \rightarrow HCO_3^-$
- C region : $NaHCO_3 + HCl \rightarrow H_2CO_33 + NaCl$
  $HCO_3^- + H^+ \rightarrow H_2CO_3$

As shown in Figure 22(a), the added volume of the 0.1M HCl is 9.68 ml with a final pH of 11.36, 9.05 (18.73-9.68) ml with a final pH of 8.32 and 9.94 (28.67-18.73) ml with a final pH of 4.09, in the regions

of A, B, C, respectively. Figure 22(b) shows a differential curve to establish the inflection point of the Figure 22(a). Contents of components producing NaOH (Na, Na_2O, etc.) in the aqueous solution were converted into Na. The contents of the components producing CO_3^{2-} ($NaHCO_3$, Na_2CO_3, etc) in the aqueous solution were converted into Na_2CO_3.

Figure 19. Photo of the Solid Product (200℃).

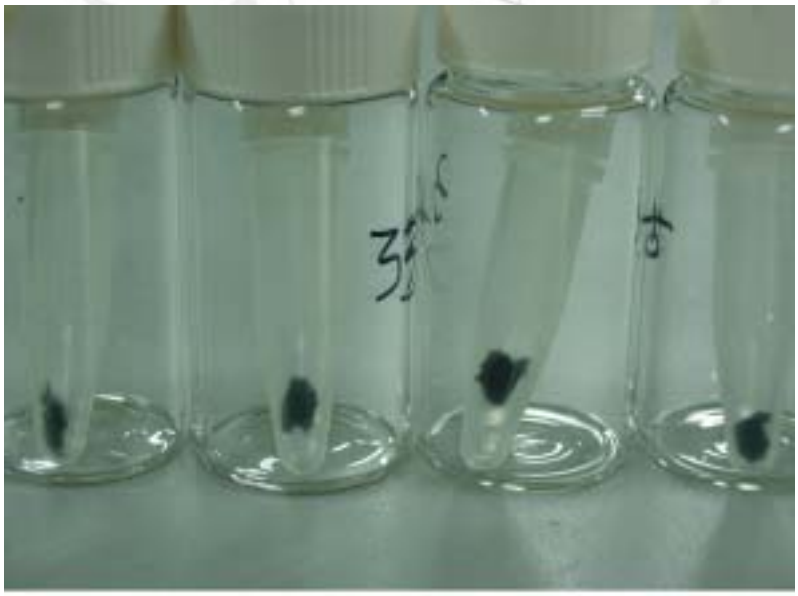


Figure 20. Sample of the Solid Product (200℃).

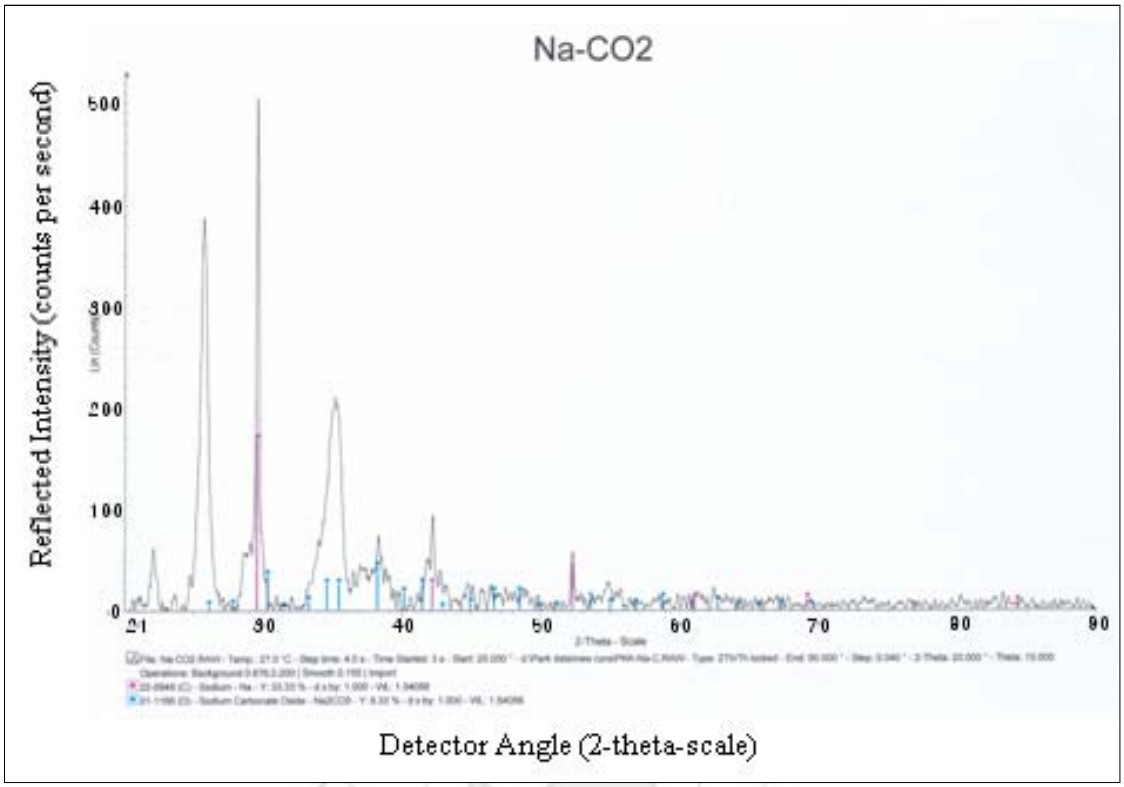


Figure 21. XRD Spectrum of the Solid Product (200℃).

In all the cases, a significant amount of sodium carbonate (Na_2CO_3) was detected. Other components such as carbon (C, Ca, Mg, Na, O) were analyzed by EPMA (Electron Probe Micro-Analysis) as shown in Figure 24 and 25 shows the SEM photo of the non water-soluble components. The black-color materials are carbons and the white-color materials are foreign materials. As a result of the analysis of non water-soluble components with EDS (Energy Dispersive Spectroscopy), it was found that the main component was carbon, and also foreign materials such as Fe, Cr, Mn, etc. were found as shown in Figure 25. The reason why Ca, Mg, Fe, Cr, Mn were detected, is seemed due to the stainless steel of the test capsule material, especially the weld bead was melted. Sodium carbonate (Na_2CO_3) was mainly observed as a reaction product. Moreover, carbon was also detected in all the cases as a result.

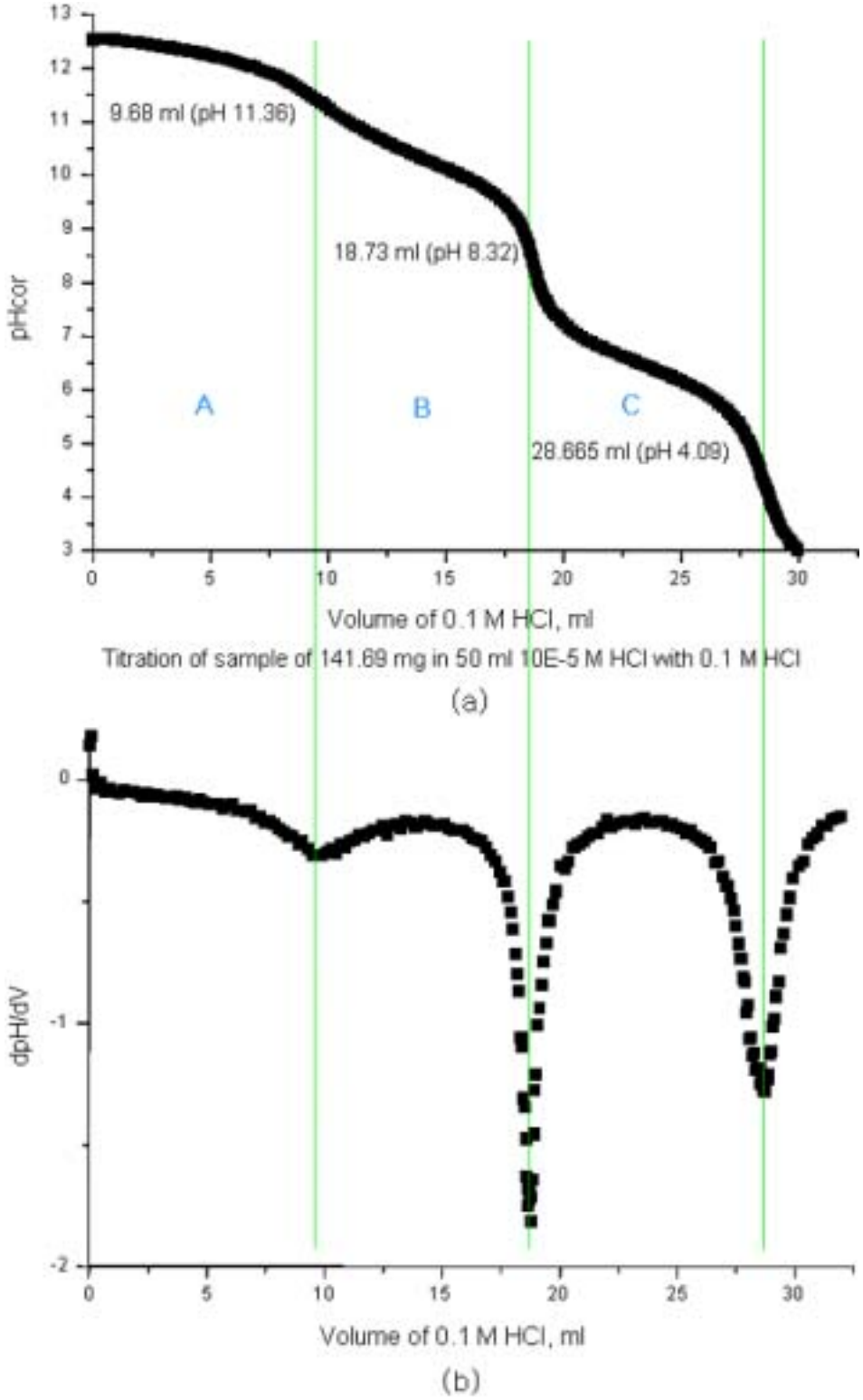


Figure 22. (a) Titration curve and (b) Differential curve of a dissolved sample in 0.1M HCl.

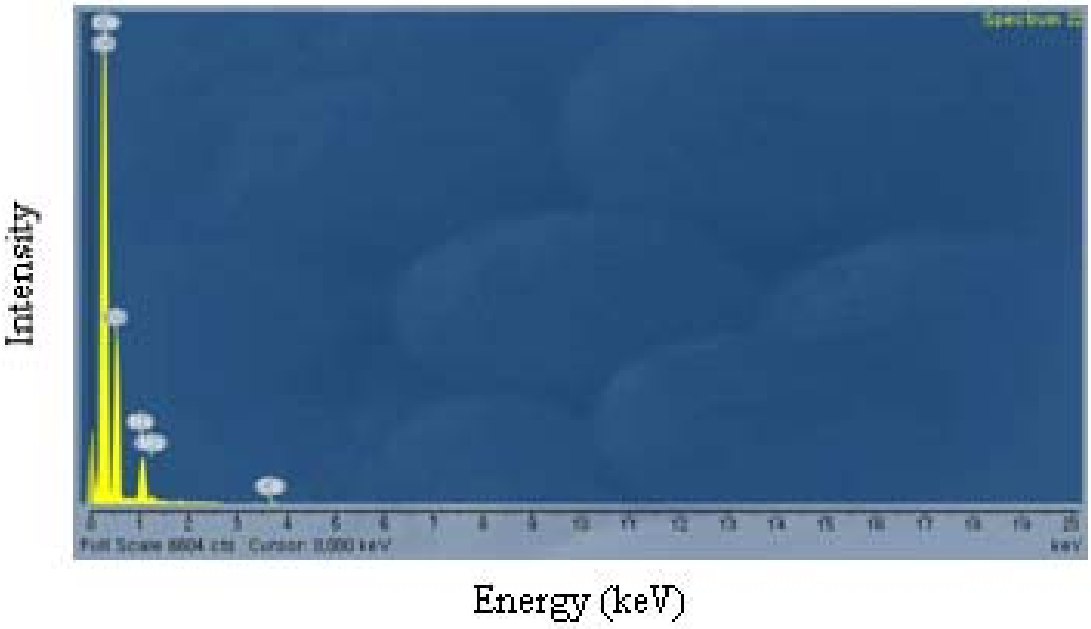


Figure 23. EDS of the non water-soluble components (C, Ca, Mg, Na, O).

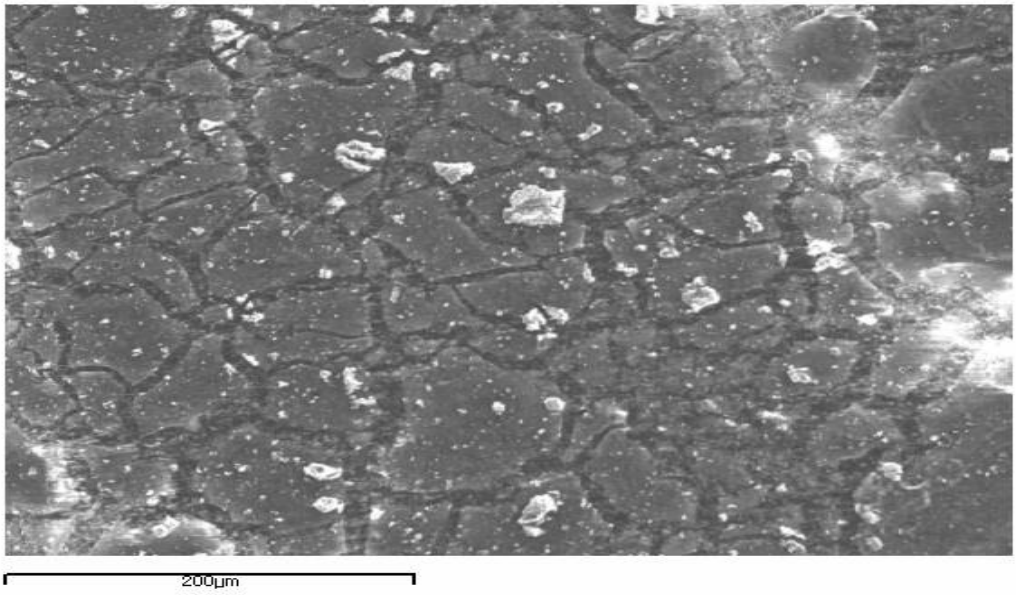


Figure 24. SEM of the foreign material (white color).

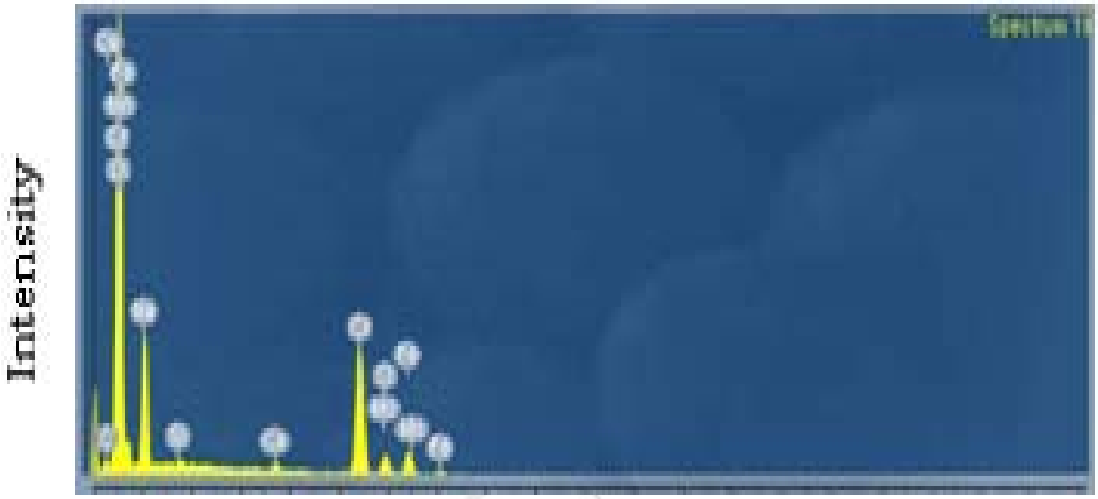


Figure 25. EDS of the Foreign Material (Fe, Cr, Mn,…).

The experimental results are shown in Tables 6, 7 and Figure 26. Table 6 shows the results of the gas analysis. The content of the carbon monoxide increased with an increase of the gas flow-rate and temperature. Table 7 and Figure 26 show the results of the solid product analysis. The content of the sodium carbonate (Na_2CO_3) was above 74% at the sodium temperature of 200℃ and it increased to about 96 % at 600℃. From these, it was confirmed that the carbon dioxide reacted readily with the liquid sodium under experimental conditions.

Table 6. Result of the Gas Analysis.

Gas Flowrate (scc/min)	Gas Supply Bottle Pressure (kg/㎠)	CO Contents (vol %)			
		Temperature (℃)			
		200	300	400	600
25	10	0.08262	0.14584	8.49827	8.69213
	30	0.10209	5.37306	6.94972	-
	40	0.45310	4.92466	4.80964	-
50	10	0.09058	-	-	-
	30	0.20858	-	-	6.33725
	40	0.17188	4.95063	3.40218	-
75	10	0.34406	-	-	-
	30	0.30192	-	-	-
	40	1.69037	5.00810	3.45914	4.80339
100	10	0.60454	-	-	-
	30	0.47354	-	-	-
	40	2.04488	5.12130	3.44083	4.04666

Table 7. Result of the Solid Analysis.

Temperature (℃)	Na or Na_2O (wt %)	Na_2CO_3 (wt %)	Others (C, etc)	Non water-soluble (wt %)
	Acid-base titration & XRD		EPMA	EDS & SEM
200	15.5±0.6	74.3±0.2	10.2±0.5	Trace
300	7.7±1.8	89.2±1.2	3.1±0.7	1.41
400	Not detected	93.9±1.5	6.1±1.5	3.61
600	Not detected	95.9±0.9	4.1±0.9	3.21

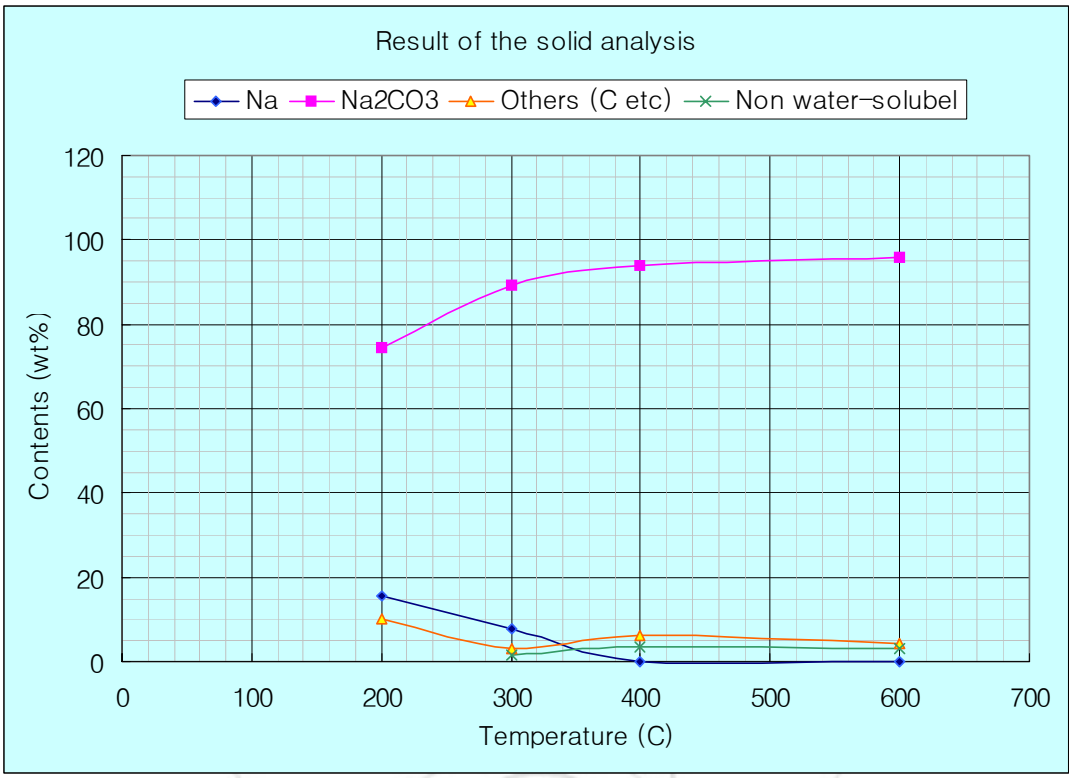


Figure 26. Result of the Solid Product Analysis.

4.0 Conclusions

The sodium-carbon dioxide reaction has been studied experimentally with a small-scale experimental apparatus using 30g of sodium. The results show that the carbon dioxide reacted readily with the liquid sodium under the experimental conditions. It seems that the interaction reaction of $Na-CO_2$ was slow at the sodium temperature of 200℃ and it became very faster above 300℃. The reaction phenomena at 300℃ and 400℃ were similar. In the case of 600℃, the reaction of $Na-CO_2$ occurred very fast. A kinetic study of the sodium-carbon dioxide reaction will be necessary to understand the threshold of the continuous reaction.

Acknowledgments

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The chemical analysis of the solid products was performed by the team in Chemical Analysis and Test Division in KAERI.

References

1. C. Latge, G. Rodriguez and N. Simon, Supercritical CO_2 Brayton Cycle for SFR : Na-CO_2 interaction and consequences on design and operation, GLOBAL 2005, Oct. 9-13, 2005.
2. H. Ishikawa, S. Miyahara and Y. Yoshizawa, Experimental Study of Sodium-Carbon dioxide Reaction, Proceedings of ICAPP '05, Paper No. 5688, 2005.

Appendix-A : Sample data (Case No. 14: Temperature; 300℃, CO_2 gas flow rate; 25 scc/min, Test capsule gas pressure; 30 kg/㎠)

	101	102	106	107	106	107
Time	Na temp.	Gas temp.	CO_2 flow rate	Test capsule gas press.	CO_2 flow rate	Test capsule gas press.
(sec)	(℃)	(℃)	(VDC)	(VDC)	(scc/min)	(kg/㎠)
1763	317.13	481.88	4.58E-04	1.52E+00	0.01	30.33
1764	316.43	481.68	4.27E-04	1.52E+00	0.01	30.33
1765	315.82	481.50	4.29E-04	1.52E+00	0.01	30.33
1766	315.33	481.32	1.11E-03	1.52E+00	0.02	30.34
1767	314.91	481.16	1.57E-03	1.52E+00	0.03	30.34
1768	314.56	480.98	1.52E-03	1.52E+00	0.03	30.34
1769	314.26	480.80	2.23E-03	1.52E+00	0.04	30.33
1770	313.97	480.63	5.67E-02	1.52E+00	1.13	30.33
1771	313.72	480.43	6.12E-02	1.52E+00	1.22	30.33
1772	313.44	480.26	6.88E-02	1.52E+00	1.38	30.33
1773	313.24	480.07	8.23E-02	1.52E+00	1.65	30.33
1774	313.05	479.91	7.52E-02	1.52E+00	1.50	30.33
1775	312.83	479.70	7.43E-02	1.52E+00	1.49	30.33
1776	312.66	479.55	6.94E-02	1.52E+00	1.39	30.32
1777	312.48	479.37	8.75E-02	1.52E+00	1.75	30.32
1778	312.29	479.20	9.04E-02	1.52E+00	1.81	30.32
1779	312.08	479.01	8.28E-02	1.52E+00	1.66	30.32
1780	311.90	478.87	8.10E-02	1.52E+00	1.62	30.32
1781	311.74	478.71	7.83E-02	1.52E+00	1.57	30.32
1782	311.58	478.57	9.18E-02	1.52E+00	1.84	30.32
1783	311.42	478.42	7.58E-02	1.52E+00	1.52	30.31
1784	311.31	478.26	8.35E-02	1.52E+00	1.67	30.31
1785	311.14	478.11	8.33E-02	1.52E+00	1.67	30.31
1786	310.98	477.98	7.52E-02	1.52E+00	1.50	30.31
1787	310.73	477.82	7.32E-02	1.52E+00	1.46	30.31
1788	310.60	477.72	8.08E-02	1.52E+00	1.62	30.31
1789	310.44	477.59	7.13E-02	1.52E+00	1.43	30.31
1790	310.29	477.45	7.51E-02	1.52E+00	1.50	30.31
1791	310.13	477.32	6.99E-02	1.52E+00	1.40	30.31
1792	309.92	477.23	6.88E-02	1.52E+00	1.38	30.31
1793	309.76	477.09	6.74E-02	1.52E+00	1.35	30.31
1794	309.61	476.98	7.18E-02	1.52E+00	1.44	30.31
1795	309.36	476.91	6.40E-02	1.52E+00	1.28	30.31
1796	309.19	476.80	5.63E-02	1.52E+00	1.13	30.30
1797	309.05	476.72	7.08E-02	1.52E+00	1.42	30.31
1798	308.93	476.66	5.84E-02	1.52E+00	1.17	30.30
1799	308.83	476.59	6.41E-02	1.52E+00	1.28	30.31
1800	308.73	476.50	5.60E-02	1.52E+00	1.12	30.31
1801	308.54	476.41	6.20E-02	1.52E+00	1.24	30.30
1802	308.37	476.33	5.70E-02	1.52E+00	1.14	30.30
1803	308.19	476.26	5.73E-02	1.52E+00	1.15	30.30
1804	308.07	476.19	4.77E-02	1.52E+00	0.95	30.30
1805	307.92	476.11	6.08E-02	1.52E+00	1.22	30.30
1806	307.73	476.03	4.83E-02	1.52E+00	0.97	30.30
1807	307.58	475.94	6.15E-02	1.52E+00	1.23	30.30
1808	307.44	475.88	5.66E-02	1.52E+00	1.13	30.30
1809	307.29	475.80	4.65E-02	1.52E+00	0.93	30.30
1810	307.14	475.74	4.84E-02	1.51E+00	0.97	30.30
1811	306.98	475.64	4.95E-02	1.52E+00	0.99	30.30
1812	306.88	475.60	5.24E-02	1.51E+00	1.05	30.30

1813	306.67	475.53	5.06E-02	1.52E+00	1.01	30.30
1814	306.59	475.49	5.05E-02	1.51E+00	1.01	30.30
1815	306.44	475.44	5.63E-02	1.51E+00	1.13	30.30
1816	306.35	475.41	4.59E-02	1.51E+00	0.92	30.30
1817	306.15	475.40	5.10E-02	1.51E+00	1.02	30.30
1818	306.05	475.32	4.63E-02	1.51E+00	0.93	30.30
1819	305.91	475.32	4.31E-02	1.51E+00	0.86	30.30
1820	305.79	475.28	4.34E-02	1.51E+00	0.87	30.30
1821	305.67	475.22	4.44E-02	1.51E+00	0.89	30.30
1822	305.56	475.23	3.93E-02	1.51E+00	0.79	30.30
1823	305.45	475.18	4.02E-02	1.51E+00	0.80	30.30
1824	305.34	475.17	4.23E-02	1.51E+00	0.85	30.30
1825	305.17	475.15	4.09E-02	1.51E+00	0.82	30.30
1826	304.99	475.14	4.56E-02	1.51E+00	0.91	30.30
1827	304.89	475.11	3.32E-02	1.51E+00	0.66	30.30
1828	304.76	475.09	3.74E-02	1.51E+00	0.75	30.30
1829	304.63	475.09	3.38E-02	1.51E+00	0.68	30.30
1830	304.53	475.07	4.65E-02	1.51E+00	0.93	30.30
1831	304.40	475.07	4.35E-02	1.51E+00	0.87	30.30
1832	304.31	475.06	3.86E-02	1.51E+00	0.77	30.30
1833	304.16	475.05	3.91E-02	1.51E+00	0.78	30.30
1834	304.07	475.04	4.17E-02	1.51E+00	0.83	30.30
1835	303.96	475.03	3.67E-02	1.51E+00	0.73	30.30
1836	303.76	475.02	3.25E-02	1.51E+00	0.65	30.30
1837	303.70	475.03	3.70E-02	1.51E+00	0.74	30.30
1838	303.72	475.01	3.91E-02	1.51E+00	0.78	30.30
1839	303.59	475.00	3.28E-02	1.51E+00	0.66	30.29
1840	303.46	475.03	2.76E-02	1.51E+00	0.55	30.29
1841	303.38	475.03	3.98E-02	1.51E+00	0.80	30.30
1842	303.21	475.06	3.05E-02	1.51E+00	0.61	30.30
1843	303.17	475.03	3.48E-02	1.51E+00	0.70	30.29
1844	303.04	475.05	2.87E-02	1.51E+00	0.57	30.29
1845	302.96	475.06	3.61E-02	1.51E+00	0.72	30.29
1846	302.86	475.08	2.55E-02	1.51E+00	0.51	30.29
1847	302.71	475.09	2.50E-02	1.51E+00	0.50	30.29
1848	302.69	475.10	2.13E-02	1.51E+00	0.43	30.29
1849	302.29	475.12	2.63E-02	1.51E+00	0.53	30.29
1850	301.88	475.15	3.05E-02	1.51E+00	0.61	30.29
1851	301.54	475.16	2.65E-02	1.51E+00	0.53	30.28
1852	301.25	475.16	2.24E-02	1.51E+00	0.45	30.28
1853	301.03	475.20	2.67E-02	1.51E+00	0.53	30.28
1854	300.86	475.24	2.76E-02	1.51E+00	0.55	30.28
1855	300.68	475.27	2.15E-02	1.51E+00	0.43	30.28
1856	300.48	475.28	3.06E-02	1.51E+00	0.61	30.28
1857	300.32	475.31	2.41E-02	1.51E+00	0.48	30.28
1858	300.18	475.35	2.26E-02	1.51E+00	0.45	30.28
1859	300.04	475.37	2.56E-02	1.51E+00	0.51	30.28
1860	299.92	475.42	2.23E-02	1.51E+00	0.45	30.28
1861	299.83	475.46	2.81E-02	1.51E+00	0.56	30.28
1862	299.75	475.51	2.69E-02	1.51E+00	0.54	30.28
1863	299.67	475.55	2.91E-02	1.51E+00	0.58	30.28
1864	299.56	475.59	2.83E-02	1.51E+00	0.57	30.28
1865	299.52	475.62	2.42E-02	1.51E+00	0.48	30.27
1866	299.44	475.68	1.86E-02	1.51E+00	0.37	30.27
1867	299.37	475.71	6.81E-04	1.51E+00	0.01	30.26
1868	299.29	475.77	1.27E-03	1.51E+00	0.03	30.27
1869	299.25	475.79	2.57E-02	1.51E+00	0.51	30.26
1870	299.20	475.82	1.98E-02	1.51E+00	0.40	30.26
1871	299.10	475.87	2.16E-02	1.51E+00	0.43	30.26
1872	299.04	475.93	2.93E-04	1.51E+00	0.01	30.26

1873	299.03	475.98	2.66E-02	1.51E+00	0.53	30.26
1874	298.94	476.00	1.88E-02	1.51E+00	0.38	30.25
1875	298.88	476.09	2.23E-02	1.51E+00	0.45	30.25
1876	298.83	476.12	-7.03E-05	1.51E+00	0.00	30.25
1877	298.84	476.18	9.13E-04	1.51E+00	0.02	30.25
1878	298.95	476.22	3.36E-02	1.51E+00	0.67	30.24
1879	298.99	476.26	2.44E-02	1.51E+00	0.49	30.24
1880	298.99	476.33	2.03E-02	1.51E+00	0.41	30.24
1881	298.91	476.37	2.43E-02	1.51E+00	0.49	30.24
1882	298.81	476.44	3.28E-02	1.51E+00	0.66	30.24
1883	298.76	476.48	2.87E-02	1.51E+00	0.57	30.24
1884	298.65	476.53	1.68E-02	1.51E+00	0.34	30.24
1885	298.56	476.61	2.35E-02	1.51E+00	0.47	30.24
1886	298.42	476.64	2.39E-02	1.51E+00	0.48	30.23
1887	298.34	476.70	2.70E-02	1.51E+00	0.54	30.23
1888	298.24	476.79	1.88E-02	1.51E+00	0.38	30.23
1889	298.12	476.85	1.70E-02	1.51E+00	0.34	30.23
1890	297.99	476.92	1.41E-02	1.51E+00	0.28	30.23
1891	297.91	476.99	1.80E-02	1.51E+00	0.36	30.23
1892	297.86	477.06	2.37E-02	1.51E+00	0.47	30.23
1893	297.75	477.12	1.93E-02	1.51E+00	0.39	30.23
1894	297.67	477.24	1.46E-02	1.51E+00	0.29	30.22
1895	297.58	477.29	2.24E-02	1.51E+00	0.45	30.22
1896	297.50	477.35	2.53E-02	1.51E+00	0.51	30.22
1897	297.43	477.43	1.78E-02	1.51E+00	0.36	30.22
1898	297.35	477.50	2.09E-02	1.51E+00	0.42	30.22
1899	297.38	477.58	1.88E-02	1.51E+00	0.38	30.22
1900	297.32	477.66	2.02E-02	1.51E+00	0.40	30.21
1901	297.30	477.75	9.55E-03	1.51E+00	0.19	30.21
1902	297.24	477.82	1.34E-02	1.51E+00	0.27	30.21
1903	297.17	477.91	2.46E-02	1.51E+00	0.49	30.21
1904	297.14	478.00	2.17E-02	1.51E+00	0.43	30.21
1905	297.09	478.08	9.41E-03	1.51E+00	0.19	30.21
1906	297.03	478.20	1.70E-02	1.51E+00	0.34	30.21
1907	297.00	478.28	2.26E-02	1.51E+00	0.45	30.21
1908	296.93	478.37	1.39E-02	1.51E+00	0.28	30.20
1909	296.88	478.50	1.21E-02	1.51E+00	0.24	30.20
1910	296.85	478.59	1.44E-02	1.51E+00	0.29	30.20
1911	296.75	478.71	1.73E-02	1.51E+00	0.35	30.20
1912	296.74	478.79	1.22E-02	1.51E+00	0.24	30.20
1913	296.74	478.89	1.84E-02	1.51E+00	0.37	30.19
1914	296.73	478.98	2.46E-02	1.51E+00	0.49	30.19
1915	296.65	479.09	2.26E-02	1.51E+00	0.45	30.19
1916	296.63	479.20	1.61E-02	1.51E+00	0.32	30.19
1917	296.58	479.29	1.87E-02	1.51E+00	0.37	30.19
1918	296.53	479.40	2.08E-02	1.51E+00	0.42	30.19
1919	296.46	479.49	1.33E-02	1.51E+00	0.27	30.18
1920	296.41	479.60	1.67E-02	1.51E+00	0.33	30.18
1921	296.38	479.70	1.55E-02	1.51E+00	0.31	30.18
1922	296.36	479.81	1.64E-02	1.51E+00	0.33	30.18
1923	296.35	479.93	9.59E-03	1.51E+00	0.19	30.18
1924	296.24	480.02	1.07E-02	1.51E+00	0.21	30.18
1925	296.25	480.14	1.13E-02	1.51E+00	0.23	30.17
1926	296.21	480.26	2.23E-02	1.51E+00	0.45	30.17
1927	296.21	480.37	1.67E-02	1.51E+00	0.33	30.17
1928	296.13	480.48	1.32E-02	1.51E+00	0.26	30.17
1929	296.10	480.59	9.82E-03	1.51E+00	0.20	30.17
1930	296.08	480.72	1.17E-02	1.51E+00	0.23	30.17
1931	296.03	480.83	1.27E-02	1.51E+00	0.25	30.16
1932	295.99	480.96	1.28E-02	1.51E+00	0.26	30.16

1933	295.95	481.07	1.39E-02	1.51E+00	0.28	30.16
1934	295.91	481.19	2.03E-02	1.51E+00	0.41	30.16
1935	295.85	481.31	1.97E-02	1.51E+00	0.39	30.16
1936	295.83	481.43	1.98E-02	1.51E+00	0.40	30.15
1937	295.79	481.55	6.11E-03	1.51E+00	0.12	30.15
1938	295.77	481.66	1.06E-02	1.51E+00	0.21	30.15
1939	295.73	481.80	1.08E-02	1.51E+00	0.22	30.15
1940	295.71	481.92	2.33E-02	1.51E+00	0.47	30.15
1941	295.68	482.06	7.61E-03	1.51E+00	0.15	30.14
1942	295.66	482.19	1.58E-02	1.51E+00	0.32	30.14
1943	295.62	482.31	8.13E-03	1.51E+00	0.16	30.14
1944	295.60	482.43	1.79E-02	1.51E+00	0.36	30.14
1945	295.52	482.57	1.05E-02	1.51E+00	0.21	30.14
1946	295.54	482.70	8.14E-03	1.51E+00	0.16	30.13
1947	295.49	482.83	1.68E-02	1.51E+00	0.34	30.13
1948	295.47	482.97	8.70E-03	1.51E+00	0.17	30.13
1949	295.44	483.13	1.35E-02	1.51E+00	0.27	30.13
1950	295.42	483.26	9.90E-03	1.51E+00	0.20	30.12
1951	295.38	483.40	1.95E-02	1.51E+00	0.39	30.12
1952	295.35	483.54	1.38E-02	1.51E+00	0.28	30.12
1953	295.35	483.68	9.67E-03	1.51E+00	0.19	30.12
1954	295.33	483.85	1.73E-02	1.51E+00	0.35	30.12
1955	295.26	483.99	7.65E-03	1.51E+00	0.15	30.11
1956	295.29	484.13	7.99E-03	1.51E+00	0.16	30.11
1957	295.22	484.27	1.24E-02	1.51E+00	0.25	30.11
1958	295.19	484.41	1.22E-02	1.51E+00	0.24	30.11
1959	295.18	484.56	2.23E-02	1.51E+00	0.45	30.10
1960	295.14	484.71	1.19E-02	1.51E+00	0.24	30.10
1961	295.16	484.85	1.18E-02	1.51E+00	0.24	30.10
1962	295.15	485.01	1.64E-02	1.50E+00	0.33	30.10
1963	295.11	485.16	8.48E-03	1.50E+00	0.17	30.10
1964	295.04	485.31	8.97E-03	1.50E+00	0.18	30.09
1965	295.09	485.44	5.35E-03	1.50E+00	0.11	30.09
1966	295.05	485.58	2.18E-02	1.50E+00	0.44	30.09
1967	295.01	485.73	1.25E-02	1.50E+00	0.25	30.09
1968	295.00	485.87	1.17E-02	1.50E+00	0.23	30.08
1969	295.00	486.04	8.41E-03	1.50E+00	0.17	30.08
1970	294.98	486.22	1.35E-02	1.50E+00	0.27	30.08
1971	294.95	486.38	1.32E-02	1.50E+00	0.26	30.08
1972	294.90	486.53	1.73E-02	1.50E+00	0.35	30.08
1973	294.90	486.68	1.28E-02	1.50E+00	0.26	30.08
1974	294.86	486.91	1.43E-02	1.50E+00	0.29	30.07
1975	294.81	487.05	1.46E-02	1.50E+00	0.29	30.07
1976	294.83	487.22	9.65E-03	1.50E+00	0.19	30.07
1977	294.88	487.38	2.12E-02	1.50E+00	0.42	30.07
1978	294.84	487.55	1.40E-02	1.50E+00	0.28	30.07
1979	294.87	487.73	2.34E-02	1.50E+00	0.47	30.07
1980	294.82	487.91	1.32E-02	1.50E+00	0.26	30.06
1981	294.89	488.07	1.00E-02	1.50E+00	0.20	30.06
1982	294.81	488.26	1.64E-02	1.50E+00	0.33	30.06
1983	294.82	488.44	1.16E-02	1.50E+00	0.23	30.06
1984	294.88	488.62	2.68E-02	1.50E+00	0.54	30.06
1985	294.90	488.78	1.02E-02	1.50E+00	0.20	30.06
1986	294.92	488.98	1.96E-02	1.50E+00	0.39	30.05
1987	294.86	489.13	1.77E-02	1.50E+00	0.35	30.05
1988	294.90	489.31	2.22E-02	1.50E+00	0.44	30.05
1989	294.90	489.47	1.47E-02	1.50E+00	0.29	30.05
1990	294.91	489.69	2.12E-02	1.50E+00	0.42	30.05
1991	294.91	489.88	1.08E-02	1.50E+00	0.22	30.05
1992	294.93	490.09	2.30E-02	1.50E+00	0.46	30.05

1993	294.91	490.28	1.83E-02	1.50E+00	0.37	30.05
1994	294.91	490.45	1.47E-02	1.50E+00	0.29	30.04
1995	294.94	490.59	1.59E-02	1.50E+00	0.32	30.04
1996	294.94	490.79	1.27E-02	1.50E+00	0.25	30.04
1997	294.94	490.97	1.66E-02	1.50E+00	0.33	30.04
1998	294.97	491.15	1.91E-02	1.50E+00	0.38	30.04
1999	294.94	491.33	1.90E-02	1.50E+00	0.38	30.03
2000	294.95	491.51	1.77E-02	1.50E+00	0.35	30.03
2001	294.95	491.73	8.65E-03	1.50E+00	0.17	30.03
2002	294.93	491.93	2.21E-02	1.50E+00	0.44	30.03
2003	294.93	492.09	1.92E-02	1.50E+00	0.38	30.03
2004	294.93	492.32	1.35E-02	1.50E+00	0.27	30.02
2005	294.96	492.47	5.02E-03	1.50E+00	0.10	30.02
2006	294.95	492.68	8.60E-03	1.50E+00	0.17	30.02
2007	294.94	492.87	1.04E-02	1.50E+00	0.21	30.02
2008	294.97	493.06	2.16E-02	1.50E+00	0.43	30.02
2009	295.02	493.26	1.29E-02	1.50E+00	0.26	30.01
2010	294.93	493.47	1.39E-02	1.50E+00	0.28	30.01
2011	294.98	493.66	5.28E-03	1.50E+00	0.11	30.01
2012	294.94	493.87	1.14E-02	1.50E+00	0.23	30.01
2013	294.95	494.08	8.03E-03	1.50E+00	0.16	30.00
2014	295.00	494.28	3.28E-03	1.50E+00	0.07	30.00
2015	295.02	494.50	6.64E-03	1.50E+00	0.13	30.00
2016	295.06	494.00	1.22E-02	1.50E+00	0.24	30.00
2017	295.08	494.19	7.13E-03	1.50E+00	0.14	29.99
2018	295.10	494.43	1.94E-02	1.50E+00	0.39	29.99
2019	295.08	495.00	4.63E-04	1.50E+00	0.01	29.99
2020	295.08	495.52	1.11E-02	1.50E+00	0.22	29.99
2021	295.07	495.77	4.82E-03	1.50E+00	0.10	29.98
2022	295.10	496.01	8.29E-04	1.50E+00	0.02	29.98
2023	295.15	496.21	9.09E-03	1.50E+00	0.18	29.98
2024	295.18	496.46	6.94E-03	1.50E+00	0.14	29.97
2025	295.19	496.68	8.05E-04	1.50E+00	0.02	29.97
2026	295.19	496.88	2.56E-03	1.50E+00	0.05	29.97
2027	295.15	497.13	1.91E-03	1.50E+00	0.04	29.97
2028	295.21	497.34	7.97E-03	1.50E+00	0.16	29.96
2029	295.24	497.58	6.44E-03	1.50E+00	0.13	29.96
2030	295.27	497.81	2.19E-03	1.50E+00	0.04	29.96
2031	295.30	498.02	5.38E-04	1.50E+00	0.01	29.95
2032	295.34	498.23	4.79E-04	1.50E+00	0.01	29.95
2033	295.41	498.46	4.87E-04	1.50E+00	0.01	29.94
2034	295.45	498.68	3.16E-04	1.50E+00	0.01	29.94
2035	295.47	498.93	5.77E-04	1.50E+00	0.01	29.94
2036	295.51	499.14	3.23E-04	1.50E+00	0.01	29.93
2037	295.54	499.37	3.88E-04	1.50E+00	0.01	29.93
2038	295.57	499.63	3.42E-04	1.50E+00	0.01	29.92
2039	295.63	499.87	2.02E-04	1.50E+00	0.00	29.92
2040	295.59	500.12	7.49E-04	1.50E+00	0.01	29.91
2041	295.62	500.37	3.77E-04	1.50E+00	0.01	29.91
2042	295.61	500.59	4.30E-04	1.50E+00	0.01	29.90
2043	295.64	500.82	4.30E-04	1.49E+00	0.01	29.90
2044	295.63	501.07	5.39E-04	1.49E+00	0.01	29.89
2045	295.67	501.31	3.38E-04	1.49E+00	0.01	29.89
2046	295.64	501.57	1.78E-04	1.49E+00	0.00	29.88
2047	295.70	501.80	2.72E-04	1.49E+00	0.01	29.88
2048	295.76	502.03	3.34E-04	1.49E+00	0.01	29.87
2049	295.77	502.27	2.67E-04	1.49E+00	0.01	29.87
2050	295.79	502.54	2.96E-04	1.49E+00	0.01	29.86
2051	295.83	502.78	4.17E-04	1.49E+00	0.01	29.86
2052	295.79	503.02	4.14E-04	1.49E+00	0.01	29.85

2053	295.89	503.29	3.85E-04	1.49E+00	0.01	29.85
2054	295.86	503.54	2.09E-04	1.49E+00	0.00	29.84
2055	295.92	503.77	3.37E-04	1.49E+00	0.01	29.83
2056	295.86	504.04	4.51E-04	1.49E+00	0.01	29.83
2057	295.91	504.31	4.50E-04	1.49E+00	0.01	29.82
2058	295.93	504.55	1.94E-04	1.49E+00	0.00	29.82
2059	295.97	504.81	4.29E-04	1.49E+00	0.01	29.81
2060	295.93	505.09	4.76E-04	1.49E+00	0.01	29.81
2061	295.95	505.36	2.75E-04	1.49E+00	0.01	29.80
2062	295.90	505.60	3.54E-04	1.49E+00	0.01	29.80
2063	295.95	505.87	3.27E-04	1.49E+00	0.01	29.79
2064	295.98	506.13	4.28E-04	1.49E+00	0.01	29.78
2065	296.02	506.37	4.14E-04	1.49E+00	0.01	29.78
2066	296.06	506.65	4.61E-04	1.49E+00	0.01	29.77
2067	296.18	506.92	4.72E-04	1.49E+00	0.01	29.77
2068	296.27	507.17	3.86E-04	1.49E+00	0.01	29.76
2069	296.37	507.46	3.77E-04	1.49E+00	0.01	29.75
2070	296.52	507.73	4.70E-04	1.49E+00	0.01	29.74
2071	296.65	507.99	4.80E-04	1.49E+00	0.01	29.73
2072	296.76	508.24	4.10E-04	1.49E+00	0.01	29.72
2073	296.94	508.51	4.22E-04	1.49E+00	0.01	29.71
2074	297.12	508.76	4.44E-04	1.49E+00	0.01	29.71
2075	297.25	509.02	4.42E-04	1.49E+00	0.01	29.70
2076	297.40	509.29	3.94E-04	1.48E+00	0.01	29.70
2077	297.58	509.55	5.22E-04	1.48E+00	0.01	29.69
2078	297.74	509.81	4.80E-04	1.48E+00	0.01	29.69
2079	297.92	510.06	6.66E-04	1.48E+00	0.01	29.68
2080	298.10	510.34	7.72E-04	1.48E+00	0.02	29.68
2081	298.29	510.58	9.17E-04	1.48E+00	0.02	29.68
2082	298.46	510.83	7.95E-04	1.48E+00	0.02	29.68
2083	298.61	511.09	8.06E-04	1.48E+00	0.02	29.67
2084	298.79	511.35	5.76E-04	1.48E+00	0.01	29.67
2085	298.88	511.60	6.82E-04	1.48E+00	0.01	29.67
2086	298.98	511.85	9.32E-04	1.48E+00	0.02	29.67
2087	299.04	512.10	9.69E-04	1.48E+00	0.02	29.67
2088	299.14	512.35	1.09E-03	1.48E+00	0.02	29.66
2089	299.28	512.60	9.68E-04	1.48E+00	0.02	29.66
2090	299.46	512.84	4.59E-03	1.48E+00	0.09	29.66
2091	299.67	513.07	9.71E-03	1.48E+00	0.19	29.65
2092	299.91	513.29	4.19E-04	1.48E+00	0.01	29.65
2093	300.14	513.54	5.06E-04	1.48E+00	0.01	29.64
2094	300.36	513.77	4.55E-04	1.48E+00	0.01	29.64
2095	300.65	513.98	5.08E-04	1.48E+00	0.01	29.63
2096	300.93	514.21	5.08E-04	1.48E+00	0.01	29.62
2097	301.21	514.41	7.53E-04	1.48E+00	0.02	29.62
2098	301.55	514.62	5.38E-04	1.48E+00	0.01	29.61
2099	301.92	514.84	2.03E-04	1.48E+00	0.00	29.60
2100	302.26	515.02	2.49E-04	1.48E+00	0.00	29.59
2101	302.73	515.25	-3.76E-05	1.48E+00	0.00	29.58
2102	303.16	515.45	-2.16E-04	1.48E+00	0.00	29.55
2103	303.63	515.60	4.47E-04	1.48E+00	0.01	29.52
2104	304.42	515.74	4.28E-04	1.47E+00	0.01	29.38
2105	306.09	515.67	3.91E-04	1.45E+00	0.01	29.03
2106	309.39	515.38	1.21E-02	1.45E+00	0.24	28.95
2107	313.30	515.18	-1.90E-04	1.44E+00	0.00	28.78
2108	318.23	514.85	4.66E-04	1.43E+00	0.01	28.59
2109	322.56	514.55	9.18E-01	1.44E+00	18.35	28.79
2110	325.71	514.46	7.83E-01	1.45E+00	15.67	28.95
2111	328.20	514.44	5.32E-01	1.45E+00	10.65	29.06
2112	330.46	514.46	2.80E-01	1.46E+00	5.61	29.13

2113	332.41	514.41	2.51E-01	1.46E+00	5.01	29.19
2114	334.20	514.39	3.22E-01	1.46E+00	6.44	29.23
2115	335.51	514.40	8.30E-01	1.47E+00	16.61	29.33
2116	336.41	514.45	4.02E-03	1.47E+00	0.08	29.36
2117	337.35	514.49	-1.93E-04	1.47E+00	0.00	29.38
2118	338.97	514.41	4.01E-04	1.46E+00	0.01	29.18
2119	341.54	514.22	4.10E-04	1.45E+00	0.01	28.98
2120	344.38	513.93	4.49E-04	1.43E+00	0.01	28.56
2121	346.96	513.70	6.30E-01	1.44E+00	12.60	28.75
2122	347.94	513.67	1.75E+00	1.45E+00	34.90	29.07
2123	347.63	513.80	1.84E-01	1.46E+00	3.68	29.11
2124	347.41	513.77	7.57E-01	1.46E+00	15.13	29.20
2125	347.10	513.77	-2.35E-04	1.46E+00	0.00	29.20
2126	347.51	513.67	4.47E-04	1.45E+00	0.01	29.07
2127	348.95	513.49	4.60E-04	1.45E+00	0.01	28.99
2128	350.71	513.36	3.72E-04	1.44E+00	0.01	28.82
2129	352.88	513.14	3.62E-04	1.43E+00	0.01	28.67
2130	355.75	512.86	4.12E-04	1.41E+00	0.01	28.15
2131	363.31	512.40	4.13E-04	1.40E+00	0.01	27.99
2132	369.55	511.93	3.84E-04	1.38E+00	0.01	27.58
2133	373.97	511.35	4.77E-04	1.35E+00	0.01	26.99
2134	376.61	510.52	4.52E-04	1.32E+00	0.01	26.43
2135	378.44	509.71	1.69E-02	1.32E+00	0.34	26.45
2136	380.51	509.22	1.39E+00	1.34E+00	27.72	26.75
2137	384.75	508.99	9.71E-01	1.36E+00	19.43	27.18
2138	392.14	513.25	-1.52E-04	1.35E+00	0.00	26.99
2139	407.65	518.06	4.14E-04	1.36E+00	0.01	27.11
2140	1062.03	522.51	2.94E-05	1.36E+00	0.00	27.13
2141	1114.66	527.57	1.35E-02	1.35E+00	0.27	27.10
2142	1029.22	529.53	3.22E-03	1.36E+00	0.06	27.14
2143	940.20	531.86	3.52E-01	1.36E+00	7.04	27.23
2144	872.76	530.50	3.37E-04	1.31E+00	0.01	26.12
2145	815.77	525.22	4.38E-04	1.24E+00	0.01	24.85
2146	740.48	622.44	4.47E-04	1.10E+00	0.01	22.02
2147	668.71	744.25	1.17E-03	1.08E+00	0.02	21.65
2148	616.05	742.89	4.02E-03	1.08E+00	0.08	21.62
2149	577.95	719.08	5.13E-01	1.11E+00	10.27	22.19
2150	550.99	682.26	1.37E+00	1.16E+00	27.39	23.10
2151	530.90	668.15	1.39E+00	1.19E+00	27.89	23.89
2152	516.04	679.23	6.82E-01	1.22E+00	13.63	24.47
2153	505.00	728.80	5.45E-01	1.26E+00	10.89	25.13
2154	497.27	826.81	1.27E-01	1.27E+00	2.54	25.40
2155	492.12	1029.06	3.73E-01	1.28E+00	7.46	25.63
2156	488.46	1179.75	6.89E-01	1.29E+00	13.77	25.80
2157	486.07	246.58	2.93E-03	1.32E+00	0.06	26.48
2158	485.54	450.27	4.09E-01	1.34E+00	8.18	26.84
2159	485.51	452.63	4.95E-01	1.36E+00	9.90	27.16
2160	485.69	362.22	8.83E-01	1.37E+00	17.66	27.45
2161	486.23	324.33	8.63E-01	1.40E+00	17.25	28.02
2162	486.38	198.32	3.94E-01	1.42E+00	7.88	28.45
2163	486.97	1200.00	3.38E-01	1.43E+00	6.77	28.59
2164	487.32	1200.00	1.78E-01	1.44E+00	3.57	28.78
2165	488.11	1340.82	4.26E-01	1.45E+00	8.52	28.91
2166	488.27	1200.00	2.09E-01	1.44E+00	4.17	28.87
2167	489.62	1200.00	-3.35E-04	1.44E+00	-0.01	28.83
2168	492.37	1200.00	3.97E-04	1.44E+00	0.01	28.81
2169	494.96	1216.26	3.66E-04	1.44E+00	0.01	28.79
2170	497.72	1200.00	3.93E-04	1.44E+00	0.01	28.78
2171	499.64	1200.00	1.51E+00	1.44E+00	30.13	28.77
2172	500.32	1200.00	7.35E-01	1.44E+00	14.71	28.77

2173	500.70	305.94	2.59E-01	1.44E+00	5.18	28.78
2174	501.07	1139.71	2.27E-04	1.44E+00	0.00	28.78
2175	501.35	1200.00	-2.21E-04	1.44E+00	0.00	28.77
2176	502.23	1172.16	4.39E-04	1.44E+00	0.01	28.77
2177	503.15	947.61	3.84E-04	1.44E+00	0.01	28.76
2178	504.53	722.78	1.05E-02	1.44E+00	0.21	28.76
2179	505.27	1200.00	2.40E-01	1.44E+00	4.79	28.76
2180	505.66	1200.00	-7.37E-05	1.44E+00	0.00	28.76
2181	505.94	1200.00	3.87E-04	1.44E+00	0.01	28.76
2182	506.29	1200.00	4.41E-04	1.44E+00	0.01	28.76
2183	506.56	773.11	1.64E-02	1.44E+00	0.33	28.75
2184	506.35	1200.00	4.77E-01	1.44E+00	9.54	28.76
2185	505.32	1200.00	3.46E-04	1.45E+00	0.01	29.02
2186	505.53	1200.00	4.24E-04	1.46E+00	0.01	29.13
2187	506.30	1200.00	4.77E-04	1.46E+00	0.01	29.20
2188	507.00	1200.00	1.06E-02	1.46E+00	0.21	29.30
2189	507.14	1200.00	3.38E-01	1.47E+00	6.76	29.39
2190	507.99	1200.00	3.87E-01	1.47E+00	7.75	29.46
2191	509.12	1200.00	4.20E-01	1.48E+00	8.40	29.56
2192	510.01	1200.00	4.53E-01	1.48E+00	9.05	29.65
2193	510.69	1200.00	3.38E-04	1.44E+00	0.01	28.88
2194	513.32	1200.00	4.15E-04	1.40E+00	0.01	28.09
2195	516.13	1200.00	3.72E-04	1.38E+00	0.01	27.53
2196	519.72	1200.00	7.88E-01	1.38E+00	15.76	27.68
2197	523.05	1200.00	1.32E+00	1.39E+00	26.41	27.76
2198	524.60	1200.00	1.65E+00	1.39E+00	33.01	27.78
2199	525.27	1200.00	5.45E-01	1.41E+00	10.90	28.22
2200	525.78	1200.00	4.89E-01	1.42E+00	9.78	28.47
2201	525.93	231.92	2.97E-01	1.43E+00	5.94	28.64
2202	525.88	1200.00	3.24E-01	1.44E+00	6.48	28.73
2203	526.15	1200.00	1.81E-01	1.44E+00	3.63	28.71
2204	525.60	1200.00	9.63E-02	1.43E+00	1.93	28.69
2205	525.99	1200.00	3.04E-03	1.43E+00	0.06	28.58
2206	526.32	1200.00	3.79E-02	1.42E+00	0.76	28.44
2207	525.27	1200.00	1.29E-01	1.41E+00	2.58	28.15
2208	522.97	1200.00	8.02E-02	1.40E+00	1.60	27.96
2209	521.04	1200.00	1.09E-01	1.39E+00	2.18	27.76
2210	519.36	1200.00	1.97E-01	1.29E+00	3.93	25.77
2211	518.82	1200.00	1.86E-01	1.22E+00	3.72	24.44
2212	517.48	1200.00	2.92E-01	1.19E+00	5.84	23.89
2213	516.23	1200.00	1.89E-01	1.17E+00	3.78	23.41
2214	515.02	1200.00	1.77E-01	1.15E+00	3.53	22.96
2215	514.67	502.77	1.73E-01	1.13E+00	3.47	22.52
2216	514.73	1200.00	1.77E-01	1.11E+00	3.54	22.11
2217	514.96	1200.00	1.37E-01	1.08E+00	2.75	21.70
2218	515.11	1200.00	5.30E-02	1.07E+00	1.06	21.31
2219	515.35	1200.00	2.79E-02	1.05E+00	0.56	21.01
2220	515.44	1200.00	1.38E-02	1.04E+00	0.28	20.71
2221	515.41	1200.00	5.84E-03	1.02E+00	0.12	20.43
2222	515.37	1200.00	8.19E-03	1.01E+00	0.16	20.16
2223	515.21	1200.00	2.30E-03	9.94E-01	0.05	19.87
2224	514.98	1200.00	3.88E-03	9.82E-01	0.08	19.64
2225	514.72	1200.00	3.70E-03	9.70E-01	0.07	19.39
2226	514.39	1200.00	1.43E-02	9.58E-01	0.29	19.15
2227	514.11	1200.00	4.81E-04	9.46E-01	0.01	18.92
2228	513.75	1200.00	2.57E-03	9.35E-01	0.05	18.70
2229	513.46	1200.00	6.66E-03	9.24E-01	0.13	18.47
2230	513.15	1200.00	2.28E-03	9.12E-01	0.05	18.25
2231	512.88	1200.00	1.84E-03	9.02E-01	0.04	18.03
2232	512.60	1200.00	7.40E-04	8.90E-01	0.01	17.81

2233	512.34	1200.00	3.26E-03	8.79E-01	0.07	17.58
2234	512.14	1200.00	5.52E-04	8.67E-01	0.01	17.35
2235	511.91	1200.00	5.35E-03	8.56E-01	0.11	17.12
2236	511.69	1200.00	4.72E-03	8.45E-01	0.09	16.91
2237	511.47	1200.00	3.89E-03	8.35E-01	0.08	16.70
2238	511.24	1200.00	4.60E-03	8.25E-01	0.09	16.50
2239	511.09	1200.00	1.37E-02	8.15E-01	0.27	16.31
2240	510.88	1200.00	7.46E-04	8.06E-01	0.01	16.12
2241	510.67	1200.00	2.46E-03	7.97E-01	0.05	15.94
2242	510.50	1200.00	1.15E-02	7.89E-01	0.23	15.77
2243	510.36	1200.00	8.51E-03	7.81E-01	0.17	15.61
2244	510.15	657.31	5.78E-04	7.73E-01	0.01	15.46
2245	509.97	1200.00	9.80E-03	7.64E-01	0.20	15.29
2246	509.79	1200.00	2.77E-03	7.54E-01	0.06	15.08
2247	509.64	1200.00	2.04E-03	7.43E-01	0.04	14.85
2248	509.45	1200.00	4.67E-03	7.31E-01	0.09	14.62
2249	509.23	1200.00	6.97E-03	7.20E-01	0.14	14.40
2250	509.08	1200.00	6.15E-04	7.10E-01	0.01	14.20
2251	508.86	1200.00	4.95E-04	7.01E-01	0.01	14.01
2252	508.72	1200.00	1.93E-03	6.92E-01	0.04	13.84
2253	508.51	1200.00	4.25E-03	6.83E-01	0.08	13.67
2254	508.33	1200.00	4.23E-03	6.75E-01	0.08	13.50
2255	508.10	1200.00	5.40E-04	6.66E-01	0.01	13.33
2256	507.93	1200.00	5.22E-04	6.58E-01	0.01	13.15
2257	507.70	1200.00	3.84E-03	6.49E-01	0.08	12.97
2258	507.53	1200.00	1.49E-03	6.39E-01	0.03	12.79
2259	507.44	1200.00	4.63E-04	6.30E-01	0.01	12.61
2260	507.09	1200.00	3.82E-04	6.21E-01	0.01	12.43
2261	506.89	1200.00	3.34E-03	6.13E-01	0.07	12.26
2262	506.67	1200.00	4.84E-04	6.05E-01	0.01	12.09
2263	506.44	1200.00	2.98E-04	5.97E-01	0.01	11.93
2264	506.23	1200.00	4.63E-04	5.89E-01	0.01	11.78
2265	506.05	1200.00	5.94E-04	5.81E-01	0.01	11.62
2266	505.77	1200.00	4.18E-04	5.74E-01	0.01	11.47
2267	505.56	1200.00	3.10E-04	5.65E-01	0.01	11.30
2268	505.38	1200.00	5.53E-04	5.58E-01	0.01	11.16
2269	505.13	1200.00	4.74E-04	5.50E-01	0.01	11.00
2270	504.88	1200.00	3.86E-04	5.43E-01	0.01	10.85
2271	504.56	1200.00	3.88E-04	5.35E-01	0.01	10.70
2272	504.21	1200.00	4.62E-04	5.27E-01	0.01	10.54
2273	503.88	1200.00	4.16E-04	5.19E-01	0.01	10.39
2274	503.59	1200.00	3.51E-04	5.12E-01	0.01	10.23
2275	503.20	1200.00	5.54E-04	5.04E-01	0.01	10.08
2276	502.84	1200.00	4.29E-04	4.96E-01	0.01	9.93
2277	502.45	1200.00	4.70E-04	4.89E-01	0.01	9.79
2278	502.10	1200.00	3.87E-04	4.82E-01	0.01	9.65
2279	501.77	1200.00	4.14E-04	4.75E-01	0.01	9.50
2280	501.44	1200.00	3.51E-04	4.68E-01	0.01	9.36
2281	501.05	1200.00	3.41E-04	4.62E-01	0.01	9.23
2282	500.76	1200.00	4.12E-04	4.56E-01	0.01	9.12
2283	500.34	1200.00	5.38E-04	4.50E-01	0.01	9.00
2284	500.01	1200.00	5.70E-04	4.44E-01	0.01	8.89
2285	499.70	1200.00	5.79E-04	4.39E-01	0.01	8.77
2286	499.36	1200.00	6.21E-04	4.33E-01	0.01	8.66
2287	499.04	1200.00	5.05E-04	4.27E-01	0.01	8.55
2288	498.74	1200.00	5.58E-04	4.22E-01	0.01	8.44
2289	498.40	1200.00	4.99E-04	4.17E-01	0.01	8.33
2290	498.10	1200.00	4.00E-04	4.11E-01	0.01	8.22
2291	497.80	1200.00	4.82E-04	4.06E-01	0.01	8.11
2292	497.50	1200.00	5.66E-04	4.00E-01	0.01	8.01

2293	497.17	1200.00	4.47E-04	3.95E-01	0.01	7.90
2294	496.84	1200.00	4.85E-04	3.90E-01	0.01	7.80
2295	496.53	1200.00	7.13E-04	3.85E-01	0.01	7.71
2296	496.23	1200.00	5.01E-04	3.81E-01	0.01	7.61
2297	495.93	-183.17	4.17E-04	3.76E-01	0.01	7.52
2298	495.59	-130.13	5.15E-04	3.71E-01	0.01	7.43
2299	495.27	-91.62	5.38E-04	3.67E-01	0.01	7.34
2300	494.94	-62.71	5.88E-04	3.63E-01	0.01	7.25
2301	494.59	-26.54	5.25E-04	3.58E-01	0.01	7.17
2302	494.29	-2.61	7.26E-04	3.54E-01	0.01	7.08
2303	493.98	20.61	4.64E-04	3.50E-01	0.01	7.00
2304	493.68	56.62	7.15E-04	3.46E-01	0.01	6.92
2305	493.37	84.29	4.66E-04	3.42E-01	0.01	6.84
2306	493.08	119.72	2.82E-03	3.38E-01	0.06	6.76
2307	492.77	123.84	7.44E-03	3.34E-01	0.15	6.68
2308	492.43	138.03	5.22E-04	3.30E-01	0.01	6.61
2309	492.12	169.83	4.19E-04	3.27E-01	0.01	6.54
2310	491.78	172.44	4.92E-04	3.23E-01	0.01	6.46
2311	491.42	215.63	1.39E-03	3.19E-01	0.03	6.39
2312	491.13	236.57	6.47E-03	3.16E-01	0.13	6.31
2313	490.81	239.43	7.11E-04	3.12E-01	0.01	6.24
2314	490.50	263.01	1.26E-03	3.09E-01	0.03	6.17
2315	490.17	257.36	6.08E-03	3.05E-01	0.12	6.10
2316	489.84	253.37	1.40E-03	3.02E-01	0.03	6.04
2317	489.49	260.71	1.27E-03	2.99E-01	0.03	5.98
2318	489.25	273.90	1.16E-02	2.96E-01	0.23	5.92
2319	488.93	298.16	3.64E-03	2.93E-01	0.07	5.86
2320	488.64	310.83	5.51E-03	2.90E-01	0.11	5.80
2321	488.26	339.72	9.93E-03	2.87E-01	0.20	5.74
2322	487.94	358.51	7.34E-04	2.84E-01	0.01	5.68
2323	487.65	379.94	1.23E-02	2.82E-01	0.25	5.63
2324	487.29	410.25	6.40E-03	2.79E-01	0.13	5.58
2325	486.97	443.46	1.84E-03	2.76E-01	0.04	5.53
2326	486.61	471.88	5.55E-04	2.74E-01	0.01	5.48
2327	486.31	499.26	4.89E-03	2.71E-01	0.10	5.43
2328	485.98	528.48	5.21E-03	2.69E-01	0.10	5.38
2329	485.69	550.24	3.49E-03	2.66E-01	0.07	5.33
2330	485.29	565.15	2.84E-03	2.64E-01	0.06	5.28
2331	485.00	597.75	3.45E-03	2.62E-01	0.07	5.24
2332	484.63	602.47	2.99E-03	2.60E-01	0.06	5.20
2333	484.32	630.41	3.58E-03	2.58E-01	0.07	5.15
2334	483.99	651.70	7.97E-03	2.55E-01	0.16	5.11
2335	483.68	668.80	5.78E-03	2.53E-01	0.12	5.07
2336	483.34	684.81	4.19E-03	2.51E-01	0.08	5.03
2337	483.09	692.14	2.00E-02	2.49E-01	0.40	4.99
2338	482.66	713.66	1.03E-02	2.48E-01	0.21	4.95
2339	482.38	725.30	6.00E-04	2.46E-01	0.01	4.91
2340	482.03	722.29	5.53E-03	2.44E-01	0.11	4.88
2341	481.73	744.89	7.34E-03	2.42E-01	0.15	4.84
2342	481.35	746.29	1.24E-02	2.40E-01	0.25	4.81
2343	481.04	754.50	9.70E-03	2.39E-01	0.19	4.77
2344	480.74	771.59	5.13E-03	2.37E-01	0.10	4.74
2345	480.46	769.34	7.74E-03	2.35E-01	0.15	4.70
2346	480.14	776.04	4.16E-04	2.34E-01	0.01	4.67
2347	479.83	784.22	4.00E-03	2.32E-01	0.08	4.64
2348	479.54	792.13	2.09E-03	2.30E-01	0.04	4.61
2349	479.19	799.11	7.10E-03	2.29E-01	0.14	4.57
2350	478.86	808.93	2.82E-03	2.27E-01	0.06	4.54
2351	478.52	815.85	1.71E-02	2.26E-01	0.34	4.51
2352	478.17	820.56	1.07E-02	2.24E-01	0.21	4.48

2353	477.89	820.88	1.41E-03	2.23E-01	0.03	4.45
2354	477.53	818.79	5.40E-03	2.21E-01	0.11	4.42
2355	477.21	817.12	1.64E-02	2.20E-01	0.33	4.39
2356	476.87	820.66	7.58E-03	2.18E-01	0.15	4.37
2357	476.52	817.23	1.19E-02	2.17E-01	0.24	4.34
2358	476.23	830.30	8.92E-04	2.16E-01	0.02	4.31
2359	475.95	813.36	9.12E-03	2.14E-01	0.18	4.29
2360	475.57	815.91	1.90E-02	2.13E-01	0.38	4.26
2361	475.21	800.54	1.17E-02	2.12E-01	0.23	4.23
2362	474.87	793.80	1.13E-02	2.10E-01	0.23	4.21
2363	474.53	763.10	1.01E-02	2.09E-01	0.20	4.18
2364	474.21	778.39	1.34E-03	2.08E-01	0.03	4.16
2365	473.92	755.75	1.52E-03	2.07E-01	0.03	4.14
2366	473.60	745.56	5.73E-03	2.06E-01	0.11	4.11
2367	473.23	732.29	1.11E-02	2.05E-01	0.22	4.09
2368	472.90	723.79	2.53E-02	2.03E-01	0.51	4.07
2369	472.58	693.49	8.21E-04	2.02E-01	0.02	4.05
2370	472.26	697.72	4.52E-03	2.01E-01	0.09	4.02
2371	471.93	676.89	1.23E-02	2.00E-01	0.25	4.00
2372	471.58	678.38	3.19E-03	1.99E-01	0.06	3.98
2373	471.28	655.20	1.05E-02	1.98E-01	0.21	3.96
2374	470.94	658.70	1.50E-02	1.97E-01	0.30	3.94
2375	470.60	647.24	1.11E-02	1.96E-01	0.22	3.92
2376	470.28	647.66	1.03E-02	1.95E-01	0.21	3.90
2377	469.95	626.65	6.77E-03	1.94E-01	0.14	3.88
2378	469.63	606.11	1.60E-02	1.93E-01	0.32	3.86
2379	469.34	622.25	8.14E-03	1.92E-01	0.16	3.84
2380	469.00	597.23	3.63E-03	1.91E-01	0.07	3.82
2381	468.67	583.53	1.41E-02	1.90E-01	0.28	3.80
2382	468.39	604.58	2.11E-03	1.89E-01	0.04	3.78
2383	468.08	591.64	5.90E-03	1.88E-01	0.12	3.77
2384	467.71	592.01	9.94E-03	1.87E-01	0.20	3.75
2385	467.45	572.58	1.53E-02	1.87E-01	0.31	3.73
2386	467.10	560.44	2.12E-03	1.86E-01	0.04	3.71
2387	466.75	566.56	1.32E-02	1.85E-01	0.26	3.70
2388	466.42	560.34	4.01E-03	1.84E-01	0.08	3.68
2389	466.09	552.01	1.06E-02	1.83E-01	0.21	3.66
2390	465.78	537.25	1.28E-02	1.82E-01	0.26	3.65
2391	465.41	522.72	2.03E-03	1.82E-01	0.04	3.63
2392	465.06	512.33	1.51E-02	1.81E-01	0.30	3.61
2393	464.74	500.39	3.82E-03	1.80E-01	0.08	3.60
2394	464.37	490.73	6.93E-03	1.79E-01	0.14	3.58
2395	464.00	495.33	1.59E-02	1.78E-01	0.32	3.57
2396	463.56	470.99	1.14E-02	1.78E-01	0.23	3.55
2397	463.28	451.64	1.31E-02	1.77E-01	0.26	3.53
2398	462.86	434.96	1.16E-02	1.76E-01	0.23	3.52
2399	462.46	415.50	1.13E-02	1.75E-01	0.23	3.51
2400	462.01	393.87	8.27E-03	1.75E-01	0.17	3.49
2401	461.62	378.04	9.41E-03	1.74E-01	0.19	3.48
2402	461.27	354.74	1.67E-02	1.73E-01	0.33	3.46
2403	460.86	340.32	1.33E-02	1.72E-01	0.27	3.45
2404	460.50	326.70	1.04E-02	1.72E-01	0.21	3.43
2405	460.18	315.64	1.85E-02	1.71E-01	0.37	3.42
2406	459.79	307.27	1.48E-02	1.70E-01	0.30	3.40
2407	459.40	305.53	7.57E-03	1.70E-01	0.15	3.39
2408	459.09	303.32	1.43E-02	1.69E-01	0.29	3.37
2409	458.80	284.45	5.09E-03	1.68E-01	0.10	3.36
2410	458.45	284.16	8.41E-03	1.67E-01	0.17	3.35
2411	458.09	274.61	1.56E-02	1.67E-01	0.31	3.34
2412	457.82	278.76	1.33E-02	1.66E-01	0.27	3.32

2413	457.53	277.57	1.36E-02	1.65E-01	0.27	3.31
2414	457.21	276.56	1.65E-02	1.65E-01	0.33	3.30
2415	456.90	275.71	2.17E-02	1.64E-01	0.43	3.28
2416	456.69	276.57	2.26E-02	1.64E-01	0.45	3.27
2417	456.36	273.55	1.49E-02	1.63E-01	0.30	3.26
2418	456.06	275.45	1.71E-02	1.62E-01	0.34	3.24
2419	455.76	277.62	1.26E-02	1.62E-01	0.25	3.23
2420	455.46	286.62	2.75E-02	1.61E-01	0.55	3.22
2421	455.14	294.69	2.94E-02	1.60E-01	0.59	3.21
2422	454.86	297.97	2.34E-02	1.60E-01	0.47	3.19
2423	454.54	297.79	2.65E-02	1.59E-01	0.53	3.18
2424	454.24	296.79	2.02E-02	1.59E-01	0.40	3.17
2425	453.95	292.33	1.84E-02	1.58E-01	0.37	3.15
2426	453.62	296.67	1.72E-02	1.57E-01	0.34	3.14
2427	453.34	284.11	2.26E-02	1.56E-01	0.45	3.13
2428	453.06	291.59	2.13E-02	1.56E-01	0.43	3.12
2429	452.79	286.28	2.55E-02	1.55E-01	0.51	3.10
2430	452.45	288.47	2.07E-02	1.55E-01	0.41	3.09
2431	452.16	288.36	2.72E-02	1.54E-01	0.54	3.08
2432	451.86	293.30	2.23E-02	1.54E-01	0.45	3.07
2433	451.57	301.70	1.77E-02	1.53E-01	0.35	3.07
2434	451.31	304.54	2.09E-02	1.53E-01	0.42	3.06
2435	450.98	305.78	1.57E-02	1.52E-01	0.31	3.05
2436	450.66	309.65	2.97E-02	1.52E-01	0.59	3.04
2437	450.39	313.68	1.93E-02	1.51E-01	0.39	3.03
2438	450.11	315.39	1.91E-02	1.51E-01	0.38	3.02
2439	449.84	316.77	1.83E-02	1.50E-01	0.37	3.01
2440	449.55	319.94	2.33E-02	1.50E-01	0.47	3.00
2441	449.29	322.19	2.91E-02	1.49E-01	0.58	2.99
2442	449.03	324.76	1.46E-02	1.49E-01	0.29	2.98
2443	448.71	323.58	1.66E-02	1.49E-01	0.33	2.97
2444	448.48	326.75	2.18E-02	1.48E-01	0.44	2.97
2445	448.20	323.42	2.32E-02	1.48E-01	0.46	2.95
2446	447.91	326.17	1.98E-02	1.47E-01	0.40	2.95
2447	447.63	330.03	2.28E-02	1.47E-01	0.46	2.94
2448	447.33	334.88	2.10E-02	1.46E-01	0.42	2.93
2449	447.10	338.12	2.57E-02	1.46E-01	0.51	2.92
2450	446.89	342.66	2.64E-02	1.45E-01	0.53	2.91
2451	446.62	343.94	2.44E-02	1.45E-01	0.49	2.90
2452	446.38	344.23	1.75E-02	1.44E-01	0.35	2.89
2453	446.12	341.40	2.52E-02	1.44E-01	0.50	2.88
2454	445.87	347.24	2.96E-02	1.43E-01	0.59	2.87
2455	445.61	347.18	1.95E-02	1.43E-01	0.39	2.85
2456	445.37	345.47	2.40E-02	1.42E-01	0.48	2.84
2457	445.17	345.95	1.57E-02	1.42E-01	0.31	2.83
2458	444.91	346.31	2.39E-02	1.41E-01	0.48	2.83
2459	444.66	347.04	2.22E-02	1.41E-01	0.44	2.82
2460	444.44	347.80	2.09E-02	1.41E-01	0.42	2.81
2461	444.16	348.98	2.63E-02	1.40E-01	0.53	2.81
2462	443.88	350.63	2.35E-02	1.40E-01	0.47	2.80
2463	443.63	351.90	1.60E-02	1.40E-01	0.32	2.79
2464	443.36	352.41	1.81E-02	1.39E-01	0.36	2.79
2465	443.13	353.88	2.05E-02	1.39E-01	0.41	2.78
2466	442.86	355.85	1.86E-02	1.39E-01	0.37	2.78
2467	442.59	357.72	2.53E-02	1.39E-01	0.51	2.77
2468	442.35	359.30	2.31E-02	1.38E-01	0.46	2.76
2469	442.13	361.12	1.52E-02	1.38E-01	0.30	2.76
2470	441.94	362.65	2.22E-02	1.38E-01	0.44	2.75
2471	441.74	363.90	1.80E-02	1.37E-01	0.36	2.74
2472	441.60	364.81	1.64E-02	1.37E-01	0.33	2.74

2473	441.37	365.56	1.94E-02	1.37E-01	0.39	2.73
2474	441.27	366.20	2.61E-02	1.36E-01	0.52	2.73
2475	441.05	366.66	1.09E-02	1.36E-01	0.22	2.72
2476	440.86	366.91	1.60E-02	1.36E-01	0.32	2.72
2477	440.61	366.69	1.89E-02	1.36E-01	0.38	2.71
2478	440.38	367.01	2.73E-02	1.35E-01	0.55	2.70
2479	440.19	367.22	2.43E-02	1.35E-01	0.49	2.70
2480	439.98	367.52	1.94E-02	1.35E-01	0.39	2.69
2481	439.71	367.75	2.24E-02	1.34E-01	0.45	2.69
2482	439.42	368.83	1.77E-02	1.34E-01	0.35	2.68
2483	439.15	368.90	1.83E-02	1.34E-01	0.37	2.68
2484	438.88	368.83	1.90E-02	1.34E-01	0.38	2.67
2485	438.67	368.67	1.83E-02	1.33E-01	0.37	2.67
2486	438.45	368.88	1.60E-02	1.33E-01	0.32	2.66
2487	438.13	369.16	2.16E-02	1.33E-01	0.43	2.66
2488	437.86	368.78	1.96E-02	1.33E-01	0.39	2.65
2489	437.55	366.26	2.48E-02	1.32E-01	0.50	2.65
2490	437.30	368.64	1.91E-02	1.32E-01	0.38	2.64
2491	437.06	368.05	1.19E-02	1.32E-01	0.24	2.64
2492	436.81	367.60	1.92E-02	1.31E-01	0.38	2.63
2493	436.52	367.57	2.60E-02	1.31E-01	0.52	2.62
2494	436.20	366.55	1.72E-02	1.31E-01	0.34	2.62
2495	435.92	366.55	2.51E-02	1.31E-01	0.50	2.62
2496	435.64	365.73	1.93E-02	1.30E-01	0.39	2.61
2497	435.34	366.45	1.80E-02	1.30E-01	0.36	2.60
2498	435.12	365.44	1.33E-02	1.30E-01	0.27	2.60
2499	434.86	365.90	2.49E-02	1.30E-01	0.50	2.59
2500	434.67	366.54	1.70E-02	1.29E-01	0.34	2.59
2501	434.33	366.02	2.55E-02	1.29E-01	0.51	2.58
2502	434.07	366.11	2.36E-02	1.29E-01	0.47	2.58
2503	433.79	365.77	2.32E-02	1.29E-01	0.46	2.57
2504	433.50	365.85	1.06E-02	1.28E-01	0.21	2.57
2505	433.21	366.17	1.93E-02	1.28E-01	0.39	2.57
2506	432.92	366.92	1.65E-02	1.28E-01	0.33	2.56
2507	432.66	366.49	1.11E-02	1.28E-01	0.22	2.55
2508	432.44	366.31	2.09E-02	1.28E-01	0.42	2.55
2509	432.17	366.53	2.92E-02	1.27E-01	0.58	2.54
2510	431.84	365.84	1.89E-02	1.27E-01	0.38	2.54
2511	431.59	365.42	1.57E-02	1.27E-01	0.31	2.54
2512	431.30	364.53	1.57E-02	1.27E-01	0.31	2.53
2513	431.04	362.13	2.06E-02	1.26E-01	0.41	2.53
2514	430.77	363.15	1.81E-02	1.26E-01	0.36	2.52
2515	430.52	361.16	2.20E-02	1.26E-01	0.44	2.52
2516	430.23	360.72	1.83E-02	1.26E-01	0.37	2.51
2517	429.95	362.47	2.52E-02	1.25E-01	0.50	2.51
2518	429.69	359.70	2.13E-02	1.25E-01	0.43	2.50
2519	429.38	358.82	2.34E-02	1.25E-01	0.47	2.50
2520	429.11	358.54	2.45E-02	1.25E-01	0.49	2.50
2521	428.80	357.71	2.18E-02	1.24E-01	0.44	2.49
2522	428.52	356.82	3.10E-02	1.24E-01	0.62	2.49
2523	428.20	356.56	1.51E-02	1.24E-01	0.30	2.48
2524	427.90	356.22	1.63E-02	1.24E-01	0.33	2.48
2525	427.62	355.52	2.26E-02	1.24E-01	0.45	2.47
2526	427.29	355.63	2.61E-02	1.23E-01	0.52	2.47
2527	427.03	355.01	1.93E-02	1.23E-01	0.39	2.46
2528	426.70	355.39	2.01E-02	1.23E-01	0.40	2.46
2529	426.43	354.70	2.19E-02	1.23E-01	0.44	2.46
2530	426.13	353.76	1.76E-02	1.22E-01	0.35	2.45
2531	425.86	352.62	2.83E-02	1.22E-01	0.57	2.45
2532	425.57	351.68	1.93E-02	1.22E-01	0.39	2.44

2533	425.27	351.10	2.86E-02	1.22E-01	0.57	2.44
2534	424.96	350.46	2.06E-02	1.22E-01	0.41	2.43
2535	424.68	350.19	2.83E-02	1.21E-01	0.57	2.43
2536	424.39	346.38	1.64E-02	1.21E-01	0.33	2.42
2537	424.15	344.10	2.40E-02	1.21E-01	0.48	2.42
2538	423.87	343.39	2.80E-02	1.21E-01	0.56	2.41
2539	423.55	343.00	1.07E-02	1.20E-01	0.21	2.41
2540	423.26	342.56	2.41E-02	1.20E-01	0.48	2.41
2541	422.94	341.93	2.46E-02	1.20E-01	0.49	2.40
2542	422.70	341.11	1.76E-02	1.20E-01	0.35	2.39
2543	422.41	340.85	1.88E-02	1.19E-01	0.38	2.39
2544	422.13	340.75	2.16E-02	1.19E-01	0.43	2.38
2545	421.86	340.82	2.38E-02	1.19E-01	0.48	2.38
2546	421.55	339.82	2.92E-02	1.19E-01	0.58	2.37
2547	421.28	339.07	2.11E-02	1.18E-01	0.42	2.37
2548	421.02	338.31	2.26E-02	1.18E-01	0.45	2.36
2549	420.73	338.24	2.10E-02	1.18E-01	0.42	2.36
2550	420.46	338.31	1.14E-02	1.18E-01	0.23	2.35
2551	420.19	338.50	2.08E-02	1.17E-01	0.42	2.35
2552	419.81	338.65	2.31E-02	1.17E-01	0.46	2.34
2553	419.66	338.35	1.59E-02	1.17E-01	0.32	2.34
2554	419.39	338.19	2.51E-02	1.17E-01	0.50	2.33
2555	419.12	336.79	2.79E-02	1.16E-01	0.56	2.33
2556	418.82	335.22	1.41E-02	1.16E-01	0.28	2.32
2557	418.55	334.61	2.18E-02	1.16E-01	0.44	2.32
2558	418.31	334.22	2.43E-02	1.15E-01	0.49	2.31
2559	418.03	332.99	1.95E-02	1.15E-01	0.39	2.30
2560	417.78	332.75	1.48E-02	1.15E-01	0.30	2.30
2561	417.47	332.17	2.40E-02	1.15E-01	0.48	2.29
2562	417.20	331.81	2.51E-02	1.14E-01	0.50	2.29
2563	416.98	331.12	2.04E-02	1.14E-01	0.41	2.28
2564	416.70	330.64	1.30E-02	1.14E-01	0.26	2.28
2565	416.46	330.35	2.14E-02	1.14E-01	0.43	2.28
2566	416.17	330.14	1.93E-02	1.13E-01	0.39	2.27
2567	415.92	329.71	1.71E-02	1.13E-01	0.34	2.26
2568	415.63	329.30	1.45E-02	1.13E-01	0.29	2.26
2569	415.40	328.90	2.63E-02	1.13E-01	0.53	2.25
2570	415.10	328.55	2.08E-02	1.12E-01	0.42	2.25
2571	414.81	327.90	2.22E-02	1.12E-01	0.44	2.24
2572	414.53	327.14	2.15E-02	1.12E-01	0.43	2.23
2573	414.24	326.74	2.37E-02	1.11E-01	0.47	2.23
2574	413.96	325.83	2.61E-02	1.11E-01	0.52	2.22
2575	413.69	324.97	2.85E-02	1.11E-01	0.57	2.22
2576	413.39	323.21	2.68E-02	1.11E-01	0.54	2.21
2577	413.11	322.66	1.72E-02	1.10E-01	0.34	2.21
2578	412.83	322.59	2.14E-02	1.10E-01	0.43	2.20
2579	412.57	322.11	1.88E-02	1.10E-01	0.38	2.20
2580	412.29	321.31	1.49E-02	1.09E-01	0.30	2.19
2581	411.99	320.93	1.84E-02	1.09E-01	0.37	2.18
2582	411.74	320.57	2.23E-02	1.09E-01	0.45	2.18
2583	411.45	320.07	2.16E-02	1.09E-01	0.43	2.17
2584	411.19	319.55	1.93E-02	1.08E-01	0.39	2.17
2585	410.89	318.93	1.88E-02	1.08E-01	0.38	2.16
2586	410.61	318.77	1.86E-02	1.08E-01	0.37	2.16
2587	410.32	318.36	1.66E-02	1.07E-01	0.33	2.15
2588	410.08	317.85	1.48E-02	1.07E-01	0.30	2.14
2589	409.79	317.44	1.96E-02	1.07E-01	0.39	2.14
2590	409.50	316.81	1.95E-02	1.07E-01	0.39	2.13
2591	409.24	315.84	2.18E-02	1.06E-01	0.44	2.13
2592	408.97	312.87	1.10E-02	1.06E-01	0.22	2.12

2593	408.67	314.84	2.68E-02	1.06E-01	0.54	2.12
2594	408.38	312.20	2.32E-02	1.06E-01	0.46	2.11
2595	408.12	311.28	1.79E-02	1.05E-01	0.36	2.10
2596	407.83	309.86	2.25E-02	1.05E-01	0.45	2.10
2597	407.57	310.14	2.44E-02	1.05E-01	0.49	2.09
2598	407.29	310.31	2.78E-02	1.04E-01	0.56	2.09
2599	407.02	309.97	1.70E-02	1.04E-01	0.34	2.08
2600	406.78	309.82	2.12E-02	1.04E-01	0.42	2.08
2601	406.49	309.27	2.21E-02	1.04E-01	0.44	2.07
2602	406.18	308.95	9.34E-03	1.03E-01	0.19	2.07
2603	405.91	308.31	2.78E-02	1.03E-01	0.56	2.06
2604	405.66	307.54	1.96E-02	1.03E-01	0.39	2.05
2605	405.42	307.01	2.36E-02	1.02E-01	0.47	2.05
2606	405.17	306.79	1.49E-02	1.02E-01	0.30	2.04
2607	404.87	306.52	1.92E-02	1.02E-01	0.38	2.04
2608	404.61	306.15	1.96E-02	1.02E-01	0.39	2.03
2609	404.32	305.75	1.21E-02	1.01E-01	0.24	2.03
2610	404.06	304.28	2.19E-02	1.01E-01	0.44	2.02
2611	403.81	304.44	1.49E-02	1.01E-01	0.30	2.02
2612	403.53	304.28	1.95E-02	1.01E-01	0.39	2.01
2613	403.27	304.05	7.11E-03	1.00E-01	0.14	2.00
2614	403.02	303.96	1.43E-02	1.00E-01	0.29	2.00
2615	402.73	303.65	1.44E-02	9.97E-02	0.29	1.99
2616	402.48	302.88	2.40E-02	9.93E-02	0.48	1.99
2617	402.21	301.56	1.76E-02	9.90E-02	0.35	1.98
2618	401.94	301.68	2.47E-02	9.88E-02	0.49	1.98
2619	401.69	301.42	2.54E-02	9.85E-02	0.51	1.97
2620	401.42	300.37	1.87E-02	9.83E-02	0.37	1.97
2621	401.17	300.13	2.01E-02	9.80E-02	0.40	1.96
2622	400.88	300.25	2.12E-02	9.77E-02	0.42	1.95
2623	400.62	299.92	1.93E-02	9.75E-02	0.39	1.95
2624	400.32	299.61	1.50E-02	9.72E-02	0.30	1.94
2625	400.08	299.06	1.92E-02	9.69E-02	0.38	1.94
2626	399.81	298.67	1.61E-02	9.67E-02	0.32	1.93
2627	399.52	298.50	2.46E-02	9.63E-02	0.49	1.93
2628	399.28	297.66	1.50E-02	9.60E-02	0.30	1.92
2629	399.02	297.10	2.22E-02	9.59E-02	0.44	1.92
2630	398.75	296.13	2.22E-02	9.55E-02	0.44	1.91
2631	398.45	295.86	1.78E-02	9.52E-02	0.36	1.90
2632	398.21	295.79	2.01E-02	9.50E-02	0.40	1.90
2633	397.92	294.86	2.14E-02	9.46E-02	0.43	1.89
2634	397.57	294.79	2.39E-02	9.43E-02	0.48	1.89
2635	397.32	294.81	2.05E-02	9.41E-02	0.41	1.88
2636	397.01	293.18	2.60E-02	9.39E-02	0.52	1.88
2637	396.75	291.60	2.09E-02	9.37E-02	0.42	1.87
2638	396.46	291.98	2.26E-02	9.35E-02	0.45	1.87
2639	396.15	292.21	2.26E-02	9.32E-02	0.45	1.86
2640	395.86	292.23	2.02E-02	9.30E-02	0.40	1.86
2641	395.59	292.10	2.04E-02	9.26E-02	0.41	1.85
2642	395.28	291.37	1.72E-02	9.24E-02	0.34	1.85
2643	395.00	291.49	1.88E-02	9.23E-02	0.38	1.85
2644	394.68	291.46	2.00E-02	9.20E-02	0.40	1.84
2645	394.44	290.32	2.34E-02	9.17E-02	0.47	1.83
2646	394.15	288.23	2.04E-02	9.15E-02	0.41	1.83
2647	393.91	288.82	2.16E-02	9.13E-02	0.43	1.83
2648	393.63	289.10	2.46E-02	9.11E-02	0.49	1.82
2649	393.34	289.02	1.73E-02	9.09E-02	0.35	1.82
2650	393.09	288.89	1.76E-02	9.08E-02	0.35	1.82
2651	392.82	288.80	1.97E-02	9.05E-02	0.39	1.81
2652	392.50	288.61	2.78E-02	9.02E-02	0.56	1.80

2653	392.27	288.49	1.72E-02	9.01E-02	0.34	1.80
2654	391.95	288.30	2.20E-02	9.00E-02	0.44	1.80
2655	391.71	288.12	1.67E-02	8.98E-02	0.33	1.80
2656	391.40	287.91	1.66E-02	8.96E-02	0.33	1.79
2657	391.10	287.56	1.49E-02	8.93E-02	0.30	1.79
2658	390.78	287.49	2.41E-02	8.91E-02	0.48	1.78
2659	390.48	287.24	2.24E-02	8.90E-02	0.45	1.78
2660	390.21	287.11	2.31E-02	8.89E-02	0.46	1.78
2661	389.90	286.88	2.50E-02	8.86E-02	0.50	1.77
2662	389.64	286.68	2.02E-02	8.85E-02	0.40	1.77
2663	389.31	286.46	1.51E-02	8.84E-02	0.30	1.77
2664	389.03	286.25	2.35E-02	8.82E-02	0.47	1.76
2665	388.77	285.99	2.84E-02	8.81E-02	0.57	1.76
2666	388.44	285.76	2.07E-02	8.80E-02	0.41	1.76
2667	388.18	285.46	2.02E-02	8.78E-02	0.40	1.76
2668	387.87	285.07	1.77E-02	8.76E-02	0.35	1.75
2669	387.61	285.03	1.81E-02	8.75E-02	0.36	1.75
2670	387.33	284.71	1.58E-02	8.73E-02	0.32	1.75
2671	387.01	284.50	2.67E-02	8.72E-02	0.53	1.74
2672	386.75	284.26	2.39E-02	8.71E-02	0.48	1.74
2673	386.48	283.86	2.23E-02	8.69E-02	0.45	1.74
2674	386.18	283.64	1.74E-02	8.66E-02	0.35	1.73
2675	385.91	283.22	1.41E-02	8.65E-02	0.28	1.73
2676	385.66	283.00	1.91E-02	8.63E-02	0.38	1.73
2677	385.37	282.85	2.41E-02	8.62E-02	0.48	1.72
2678	385.05	282.53	3.08E-02	8.60E-02	0.62	1.72
2679	384.76	282.40	1.65E-02	8.59E-02	0.33	1.72
2680	384.48	282.15	2.37E-02	8.58E-02	0.47	1.72
2681	384.20	281.90	3.23E-02	8.57E-02	0.65	1.71
2682	383.91	281.68	2.13E-02	8.54E-02	0.43	1.71
2683	383.65	281.39	1.61E-02	8.53E-02	0.32	1.71
2684	383.43	281.37	1.63E-02	8.51E-02	0.33	1.70
2685	383.21	281.23	3.47E-02	8.50E-02	0.69	1.70
2686	382.99	280.84	1.13E-02	8.49E-02	0.23	1.70
2687	382.65	280.61	2.69E-02	8.48E-02	0.54	1.70
2688	382.42	280.33	2.47E-02	8.45E-02	0.49	1.69
2689	382.11	279.97	1.32E-02	8.43E-02	0.26	1.69
2690	381.91	279.60	2.23E-02	8.41E-02	0.45	1.68
2691	381.61	279.40	1.97E-02	8.40E-02	0.39	1.68
2692	381.34	279.14	2.40E-02	8.39E-02	0.48	1.68
2693	381.09	278.96	2.31E-02	8.38E-02	0.46	1.68
2694	380.84	278.55	2.38E-02	8.37E-02	0.48	1.67
2695	380.56	278.47	2.45E-02	8.35E-02	0.49	1.67
2696	380.30	278.24	2.54E-02	8.34E-02	0.51	1.67
2697	380.04	278.01	1.19E-02	8.32E-02	0.24	1.66
2698	379.78	277.81	2.22E-02	8.31E-02	0.44	1.66
2699	379.52	277.58	2.00E-02	8.30E-02	0.40	1.66
2700	379.26	277.33	2.30E-02	8.28E-02	0.46	1.66
2701	379.01	277.11	3.21E-02	8.26E-02	0.64	1.65
2702	378.77	276.94	2.25E-02	8.24E-02	0.45	1.65
2703	378.51	276.71	1.85E-02	8.23E-02	0.37	1.65
2704	378.25	276.97	1.51E-02	8.20E-02	0.30	1.64
2705	377.97	277.51	2.55E-02	8.19E-02	0.51	1.64
2706	377.71	277.30	1.62E-02	8.17E-02	0.32	1.63
2707	377.46	277.26	2.69E-02	8.15E-02	0.54	1.63
2708	377.18	277.18	2.19E-02	8.13E-02	0.44	1.63
2709	376.97	277.41	1.20E-02	8.11E-02	0.24	1.62
2710	376.71	277.59	2.30E-02	8.09E-02	0.46	1.62
2711	376.44	277.53	2.26E-02	8.09E-02	0.45	1.62
2712	376.19	277.36	2.19E-02	8.07E-02	0.44	1.61

2713	375.91	277.12	1.98E-02	8.05E-02	0.40	1.61
2714	375.64	276.85	2.06E-02	8.03E-02	0.41	1.61
2715	375.41	276.87	2.04E-02	8.02E-02	0.41	1.60
2716	375.16	276.52	2.04E-02	8.01E-02	0.41	1.60
2717	374.89	275.22	1.89E-02	8.00E-02	0.38	1.60
2718	374.64	274.86	2.31E-02	7.98E-02	0.46	1.60
2719	374.38	274.53	1.26E-02	7.98E-02	0.25	1.60
2720	374.14	274.20	3.00E-02	7.97E-02	0.60	1.59
2721	373.89	273.90	1.88E-02	7.95E-02	0.38	1.59
2722	373.63	273.68	2.07E-02	7.95E-02	0.41	1.59
2723	373.37	273.75	1.81E-02	7.94E-02	0.36	1.59
2724	373.10	273.70	2.25E-02	7.93E-02	0.45	1.59
2725	372.87	273.63	2.52E-02	7.93E-02	0.50	1.59
2726	372.62	273.55	1.75E-02	7.92E-02	0.35	1.58
2727	372.34	273.35	1.66E-02	7.90E-02	0.33	1.58
2728	372.09	273.15	2.22E-02	7.90E-02	0.44	1.58
2729	371.85	272.92	1.23E-02	7.88E-02	0.25	1.58
2730	371.59	272.70	2.29E-02	7.87E-02	0.46	1.57
2731	371.34	272.43	1.04E-02	7.87E-02	0.21	1.57
2732	371.08	272.18	2.23E-02	7.86E-02	0.45	1.57
2733	370.84	271.86	1.83E-02	7.83E-02	0.37	1.57
2734	370.62	271.65	2.52E-02	7.83E-02	0.50	1.57
2735	370.32	271.39	1.91E-02	7.82E-02	0.38	1.56
2736	370.05	271.15	1.93E-02	7.81E-02	0.39	1.56
2737	369.84	270.90	2.51E-02	7.81E-02	0.50	1.56
2738	369.56	270.65	1.97E-02	7.80E-02	0.39	1.56
2739	369.27	270.40	2.46E-02	7.80E-02	0.49	1.56
2740	369.03	270.15	1.69E-02	7.78E-02	0.34	1.56
2741	368.79	269.87	2.30E-02	7.78E-02	0.46	1.56
2742	368.52	269.62	1.29E-02	7.77E-02	0.26	1.55
2743	368.28	269.35	2.21E-02	7.76E-02	0.44	1.55
2744	368.01	269.10	1.38E-02	7.75E-02	0.28	1.55
2745	367.73	268.83	2.27E-02	7.74E-02	0.45	1.55
2746	367.48	268.59	2.25E-02	7.73E-02	0.45	1.55
2747	367.24	268.33	1.69E-02	7.73E-02	0.34	1.55
2748	366.97	268.08	2.38E-02	7.71E-02	0.48	1.54
2749	366.72	267.86	2.49E-02	7.70E-02	0.50	1.54
2750	366.47	267.59	1.78E-02	7.69E-02	0.36	1.54
2751	366.17	267.36	2.68E-02	7.69E-02	0.54	1.54
2752	365.93	267.12	2.01E-02	7.68E-02	0.40	1.54
2753	365.68	266.84	1.87E-02	7.68E-02	0.37	1.54
2754	365.38	266.58	2.12E-02	7.66E-02	0.42	1.53
2755	365.15	266.30	1.63E-02	7.66E-02	0.33	1.53
2756	364.85	266.04	3.18E-02	7.66E-02	0.64	1.53
2757	364.58	265.79	1.96E-02	7.64E-02	0.39	1.53
2758	364.28	265.56	2.38E-02	7.64E-02	0.48	1.53
2759	364.03	265.29	1.79E-02	7.63E-02	0.36	1.53
2760	363.73	265.04	2.14E-02	7.62E-02	0.43	1.52
2761	363.47	264.79	2.00E-02	7.60E-02	0.40	1.52
2762	363.22	264.53	2.11E-02	7.60E-02	0.42	1.52
2763	362.96	264.28	1.83E-02	7.59E-02	0.37	1.52
2764	362.67	264.02	1.97E-02	7.57E-02	0.39	1.51
2765	362.37	263.77	1.82E-02	7.56E-02	0.36	1.51
2766	362.08	263.53	1.93E-02	7.56E-02	0.39	1.51
2767	361.82	263.29	1.87E-02	7.55E-02	0.37	1.51
2768	361.53	263.07	1.97E-02	7.54E-02	0.39	1.51
2769	361.25	262.82	1.72E-02	7.53E-02	0.34	1.51
2770	360.96	262.61	1.89E-02	7.52E-02	0.38	1.50
2771	360.73	262.36	2.38E-02	7.51E-02	0.48	1.50
2772	360.44	262.09	2.00E-02	7.50E-02	0.40	1.50

2773	360.15	261.87	2.12E-02	7.49E-02	0.42	1.50
2774	359.88	261.64	2.20E-02	7.48E-02	0.44	1.50
2775	359.59	261.42	2.31E-02	7.46E-02	0.46	1.49
2776	359.35	261.17	2.05E-02	7.44E-02	0.41	1.49
2777	359.03	260.97	1.85E-02	7.43E-02	0.37	1.49
2778	358.85	260.75	2.13E-02	7.42E-02	0.43	1.48
2779	358.56	260.51	2.39E-02	7.41E-02	0.48	1.48
2780	358.33	260.28	2.12E-02	7.39E-02	0.42	1.48
2781	358.11	260.06	2.60E-02	7.38E-02	0.52	1.48
2782	357.81	259.81	1.16E-02	7.37E-02	0.23	1.47
2783	357.58	259.62	2.21E-02	7.36E-02	0.44	1.47
2784	357.35	259.42	2.30E-02	7.35E-02	0.46	1.47
2785	357.13	259.21	1.89E-02	7.34E-02	0.38	1.47
2786	356.87	259.01	2.07E-02	7.33E-02	0.41	1.47
2787	356.61	258.79	2.68E-02	7.32E-02	0.54	1.46
2788	356.36	258.65	2.99E-02	7.30E-02	0.60	1.46
2789	356.10	258.49	1.57E-02	7.29E-02	0.31	1.46
2790	355.85	258.31	1.77E-02	7.28E-02	0.35	1.46
2791	355.57	258.15	3.26E-02	7.27E-02	0.65	1.45
2792	355.33	258.06	2.60E-02	7.26E-02	0.52	1.45
2793	355.05	257.91	2.04E-02	7.25E-02	0.41	1.45
2794	354.79	257.77	1.94E-02	7.25E-02	0.39	1.45
2795	354.53	257.68	2.75E-02	7.23E-02	0.55	1.45
2796	354.33	257.72	2.71E-02	7.23E-02	0.54	1.45
2797	354.02	257.50	2.01E-02	7.22E-02	0.40	1.44
2798	353.74	257.31	2.12E-02	7.22E-02	0.42	1.44
2799	353.49	257.09	1.99E-02	7.21E-02	0.40	1.44
2800	353.23	256.88	1.51E-02	7.20E-02	0.30	1.44
2801	352.98	256.70	1.35E-02	7.19E-02	0.27	1.44
2802	352.72	256.39	2.27E-02	7.18E-02	0.45	1.44
2803	352.44	256.15	2.03E-02	7.18E-02	0.41	1.44
2804	352.20	255.91	2.32E-02	7.17E-02	0.46	1.43
2805	351.96	255.72	2.21E-02	7.16E-02	0.44	1.43
2806	351.69	255.56	2.09E-02	7.16E-02	0.42	1.43
2807	351.47	255.45	2.13E-02	7.15E-02	0.43	1.43
2808	351.21	255.30	1.44E-02	7.14E-02	0.29	1.43
2809	350.95	255.10	3.22E-02	7.14E-02	0.64	1.43
2810	350.72	254.90	1.89E-02	7.14E-02	0.38	1.43
2811	350.45	254.69	2.32E-02	7.12E-02	0.46	1.42
2812	350.18	254.28	1.61E-02	7.13E-02	0.32	1.43
2813	349.94	254.03	1.47E-02	7.11E-02	0.29	1.42
2814	349.69	254.09	2.29E-02	7.11E-02	0.46	1.42
2815	349.47	253.86	2.40E-02	7.10E-02	0.48	1.42
2816	349.20	253.69	2.41E-02	7.10E-02	0.48	1.42
2817	348.98	253.49	1.97E-02	7.09E-02	0.39	1.42
2818	348.72	253.30	2.13E-02	7.08E-02	0.43	1.42
2819	348.45	253.10	1.94E-02	7.07E-02	0.39	1.41
2820	348.19	252.90	2.54E-02	7.07E-02	0.51	1.41
2821	347.99	252.72	2.20E-02	7.06E-02	0.44	1.41
2822	347.72	252.53	2.39E-02	7.06E-02	0.48	1.41
2823	347.50	252.30	1.93E-02	7.05E-02	0.39	1.41
2824	347.26	252.13	1.77E-02	7.04E-02	0.35	1.41
2825	347.00	251.92	2.55E-02	7.04E-02	0.51	1.41
2826	346.75	251.74	2.08E-02	7.03E-02	0.42	1.41
2827	346.48	251.53	1.70E-02	7.03E-02	0.34	1.41
2828	346.20	251.35	1.57E-02	7.01E-02	0.31	1.40
2829	345.95	251.15	2.38E-02	7.01E-02	0.48	1.40
2830	345.71	250.96	2.04E-02	7.01E-02	0.41	1.40
2831	345.48	250.75	2.08E-02	7.01E-02	0.42	1.40
2832	345.25	250.49	1.35E-02	6.99E-02	0.27	1.40

2833	345.01	250.21	1.83E-02	6.99E-02	0.37	1.40
2834	344.75	250.04	2.09E-02	6.98E-02	0.42	1.40
2835	344.56	249.82	1.62E-02	6.98E-02	0.32	1.40
2836	344.30	249.62	2.36E-02	6.96E-02	0.47	1.39
2837	344.07	249.44	1.87E-02	6.96E-02	0.37	1.39
2838	343.83	249.28	1.71E-02	6.95E-02	0.34	1.39
2839	343.63	249.07	1.66E-02	6.95E-02	0.33	1.39
2840	343.38	248.90	8.42E-03	6.95E-02	0.17	1.39
2841	343.14	248.69	2.37E-02	6.94E-02	0.47	1.39
2842	342.94	248.51	1.71E-02	6.94E-02	0.34	1.39
2843	342.63	248.32	1.87E-02	6.94E-02	0.37	1.39
2844	342.38	248.16	2.05E-02	6.92E-02	0.41	1.38
2845	342.20	247.99	2.35E-02	6.92E-02	0.47	1.38
2846	341.90	247.81	1.60E-02	6.92E-02	0.32	1.38
2847	341.70	247.60	1.73E-02	6.91E-02	0.35	1.38
2848	341.48	247.41	1.82E-02	6.90E-02	0.36	1.38
2849	341.25	247.23	2.01E-02	6.89E-02	0.40	1.38
2850	341.01	247.07	2.29E-02	6.89E-02	0.46	1.38
2851	340.82	246.89	2.30E-02	6.88E-02	0.46	1.38
2852	340.56	246.72	1.69E-02	6.87E-02	0.34	1.37
2853	340.32	246.54	2.08E-02	6.87E-02	0.42	1.37
2854	340.10	246.35	2.00E-02	6.87E-02	0.40	1.37
2855	339.87	246.16	1.55E-02	6.86E-02	0.31	1.37
2856	339.70	246.02	3.02E-02	6.86E-02	0.60	1.37
2857	339.42	245.85	1.87E-02	6.86E-02	0.37	1.37
2858	339.26	245.67	2.29E-02	6.85E-02	0.46	1.37
2859	338.99	245.53	2.27E-02	6.84E-02	0.45	1.37
2860	338.79	245.35	2.68E-02	6.83E-02	0.54	1.37
2861	338.59	245.01	2.42E-02	6.83E-02	0.48	1.37
2862	338.38	244.83	1.74E-02	6.82E-02	0.35	1.36
2863	338.15	244.62	2.58E-02	6.82E-02	0.52	1.36
2864	337.92	244.48	2.52E-02	6.81E-02	0.50	1.36
2865	337.73	244.30	2.22E-02	6.80E-02	0.44	1.36
2866	337.50	244.14	1.74E-02	6.79E-02	0.35	1.36
2867	337.28	243.96	1.52E-02	6.78E-02	0.30	1.36
2868	337.05	243.78	2.48E-02	6.78E-02	0.50	1.36
2869	336.85	243.62	1.95E-02	6.78E-02	0.39	1.36
2870	336.60	243.44	1.66E-02	6.77E-02	0.33	1.35
2871	336.35	243.26	2.34E-02	6.77E-02	0.47	1.35
2872	336.13	243.08	1.02E-02	6.76E-02	0.20	1.35
2873	335.87	242.90	1.61E-02	6.76E-02	0.32	1.35
2874	335.64	242.72	2.09E-02	6.76E-02	0.42	1.35
2875	335.44	242.54	1.94E-02	6.75E-02	0.39	1.35
2876	335.19	242.38	2.64E-02	6.74E-02	0.53	1.35
2877	334.96	242.18	1.60E-02	6.74E-02	0.32	1.35
2878	334.75	242.02	2.37E-02	6.73E-02	0.47	1.35
2879	334.54	241.84	2.49E-02	6.72E-02	0.50	1.34
2880	334.28	241.67	2.63E-02	6.71E-02	0.53	1.34
2881	334.08	241.50	2.90E-02	6.71E-02	0.58	1.34
2882	333.83	241.36	2.63E-02	6.70E-02	0.53	1.34
2883	333.57	241.18	2.05E-02	6.69E-02	0.41	1.34
2884	333.38	241.00	1.69E-02	6.69E-02	0.34	1.34
2885	333.12	240.87	2.30E-02	6.69E-02	0.46	1.34
2886	332.95	240.71	2.46E-02	6.69E-02	0.49	1.34
2887	332.73	240.52	2.09E-02	6.68E-02	0.42	1.34
2888	332.56	240.37	2.30E-02	6.66E-02	0.46	1.33
2889	332.28	240.20	2.56E-02	6.67E-02	0.51	1.33
2890	332.10	240.04	3.23E-02	6.65E-02	0.65	1.33
2891	331.89	239.86	1.10E-02	6.65E-02	0.22	1.33
2892	331.72	239.70	1.43E-02	6.65E-02	0.29	1.33

2893	331.48	239.51	2.51E-02	6.64E-02	0.50	1.33
2894	331.29	239.36	2.10E-02	6.63E-02	0.42	1.33
2895	331.18	239.18	3.08E-02	6.62E-02	0.62	1.32
2896	331.00	239.03	1.77E-02	6.61E-02	0.35	1.32
2897	330.83	238.87	1.78E-02	6.61E-02	0.36	1.32
2898	330.70	238.68	2.04E-02	6.60E-02	0.41	1.32
2899	330.54	238.50	2.80E-02	6.59E-02	0.56	1.32
2900	330.38	238.35	1.17E-02	6.59E-02	0.23	1.32
2901	330.24	238.19	1.10E-02	6.59E-02	0.22	1.32
2902	330.06	238.02	2.17E-02	6.58E-02	0.43	1.32
2903	329.89	237.85	1.83E-02	6.58E-02	0.37	1.32
2904	329.77	237.71	2.29E-02	6.57E-02	0.46	1.31
2905	329.62	237.54	1.71E-02	6.56E-02	0.34	1.31
2906	329.42	237.39	1.98E-02	6.55E-02	0.40	1.31
2907	329.27	237.23	1.84E-02	6.54E-02	0.37	1.31
2908	329.07	237.09	2.95E-02	6.55E-02	0.59	1.31
2909	328.93	236.92	1.96E-02	6.54E-02	0.39	1.31
2910	328.75	236.75	1.19E-02	6.53E-02	0.24	1.31
2911	328.56	236.61	2.41E-02	6.52E-02	0.48	1.30
2912	328.39	236.45	3.00E-02	6.52E-02	0.60	1.30
2913	328.19	236.28	1.91E-02	6.52E-02	0.38	1.30
2914	328.04	236.14	2.17E-02	6.51E-02	0.43	1.30
2915	327.84	236.00	2.29E-02	6.51E-02	0.46	1.30
2916	327.65	235.86	2.23E-02	6.50E-02	0.45	1.30
2917	327.47	235.69	2.57E-02	6.50E-02	0.51	1.30
2918	327.29	235.58	3.19E-02	6.49E-02	0.64	1.30
2919	327.08	235.41	2.27E-02	6.48E-02	0.45	1.30
2920	326.88	235.27	1.59E-02	6.48E-02	0.32	1.30
2921	326.67	235.13	1.83E-02	6.47E-02	0.37	1.29
2922	326.46	234.97	1.79E-02	6.46E-02	0.36	1.29
2923	326.24	234.80	1.31E-02	6.45E-02	0.26	1.29
2924	326.07	234.66	2.25E-02	6.44E-02	0.45	1.29
2925	325.92	234.51	1.59E-02	6.43E-02	0.32	1.29
2926	325.71	234.37	2.09E-02	6.43E-02	0.42	1.29
2927	325.49	234.20	1.76E-02	6.42E-02	0.35	1.28
2928	325.25	234.07	1.56E-02	6.41E-02	0.31	1.28
2929	325.07	233.95	2.21E-02	6.40E-02	0.44	1.28
2930	324.86	233.81	1.95E-02	6.40E-02	0.39	1.28
2931	324.67	233.71	2.00E-02	6.39E-02	0.40	1.28
2932	324.49	233.59	2.24E-02	6.38E-02	0.45	1.28
2933	324.29	233.46	2.56E-02	6.38E-02	0.51	1.28
2934	324.12	233.30	1.04E-02	6.37E-02	0.21	1.27
2935	323.92	233.15	2.27E-02	6.36E-02	0.45	1.27
2936	323.72	233.01	2.26E-02	6.35E-02	0.45	1.27
2937	323.53	232.84	2.24E-02	6.35E-02	0.45	1.27
2938	323.32	232.64	1.70E-02	6.34E-02	0.34	1.27
2939	323.14	232.55	2.86E-02	6.33E-02	0.57	1.27
2940	322.93	232.40	2.09E-02	6.32E-02	0.42	1.26
2941	322.69	232.26	1.33E-02	6.32E-02	0.27	1.26
2942	322.48	232.08	2.74E-02	6.32E-02	0.55	1.26
2943	322.32	231.94	1.60E-02	6.31E-02	0.32	1.26
2944	322.17	231.80	2.65E-02	6.30E-02	0.53	1.26
2945	321.96	231.63	1.77E-02	6.30E-02	0.35	1.26
2946	321.75	231.44	2.55E-02	6.29E-02	0.51	1.26
2947	321.53	231.32	1.83E-02	6.29E-02	0.37	1.26
2948	321.31	231.15	1.74E-02	6.28E-02	0.35	1.26
2949	321.10	231.02	1.40E-02	6.28E-02	0.28	1.26
2950	320.90	230.85	1.48E-02	6.27E-02	0.30	1.25
2951	320.64	230.69	1.59E-02	6.27E-02	0.32	1.25
2952	320.42	230.56	2.55E-02	6.26E-02	0.51	1.25

2953	320.21	230.39	2.54E-02	6.25E-02	0.51	1.25
2954	320.02	230.24	1.75E-02	6.25E-02	0.35	1.25
2955	319.80	230.11	1.81E-02	6.24E-02	0.36	1.25
2956	319.56	229.96	2.20E-02	6.25E-02	0.44	1.25
2957	319.37	229.80	2.80E-02	6.24E-02	0.56	1.25
2958	319.13	229.68	1.98E-02	6.23E-02	0.40	1.25
2959	318.90	229.29	1.57E-02	6.23E-02	0.31	1.25
2960	318.69	229.16	1.89E-02	6.23E-02	0.38	1.25
2961	318.48	229.01	2.06E-02	6.22E-02	0.41	1.24
2962	318.27	228.87	9.79E-03	6.22E-02	0.20	1.24
2963	318.00	223.11	1.99E-02	6.21E-02	0.40	1.24
2964	317.84	228.78	1.37E-02	6.21E-02	0.27	1.24
2965	317.63	228.70	1.84E-02	6.20E-02	0.37	1.24
2966	317.43	228.50	1.99E-02	6.20E-02	0.40	1.24
2967	317.19	228.39	1.63E-02	6.20E-02	0.33	1.24
2968	316.97	228.23	2.09E-02	6.20E-02	0.42	1.24
2969	316.80	228.10	2.25E-02	6.19E-02	0.45	1.24
2970	316.56	227.97	2.44E-02	6.19E-02	0.49	1.24
2971	316.37	227.81	1.66E-02	6.19E-02	0.33	1.24
2972	316.15	227.68	1.49E-02	6.19E-02	0.30	1.24
2973	315.95	227.54	2.28E-02	6.19E-02	0.46	1.24
2974	315.77	227.41	1.87E-02	6.19E-02	0.37	1.24
2975	315.58	227.25	2.47E-02	6.18E-02	0.49	1.24
2976	315.36	227.12	2.38E-02	6.18E-02	0.48	1.24
2977	315.16	226.99	1.91E-02	6.18E-02	0.38	1.24
2978	314.94	226.84	2.49E-02	6.17E-02	0.50	1.23
2979	314.75	226.71	1.62E-02	6.18E-02	0.32	1.24
2980	314.53	226.56	2.50E-02	6.17E-02	0.50	1.23
2981	314.31	226.42	2.56E-02	6.16E-02	0.51	1.23
2982	314.11	226.32	2.29E-02	6.15E-02	0.46	1.23
2983	313.90	226.16	1.65E-02	6.15E-02	0.33	1.23
2984	313.70	226.04	2.13E-02	6.15E-02	0.43	1.23
2985	313.49	225.88	1.58E-02	6.14E-02	0.32	1.23
2986	313.28	225.75	1.76E-02	6.14E-02	0.35	1.23
2987	313.07	225.63	2.21E-02	6.14E-02	0.44	1.23
2988	312.85	225.48	1.49E-02	6.14E-02	0.30	1.23
2989	312.64	225.35	2.89E-02	6.13E-02	0.58	1.23
2990	312.45	225.20	2.16E-02	6.13E-02	0.43	1.23
2991	312.25	225.08	1.78E-02	6.12E-02	0.36	1.22
2992	311.99	224.94	2.13E-02	6.13E-02	0.43	1.23
2993	311.78	224.80	1.51E-02	6.11E-02	0.30	1.22
2994	311.62	224.68	2.22E-02	6.12E-02	0.44	1.22
2995	311.43	224.61	1.33E-02	6.11E-02	0.27	1.22
2996	311.24	224.40	1.10E-02	6.10E-02	0.22	1.22
2997	311.04	224.28	2.11E-02	6.11E-02	0.42	1.22
2998	310.83	224.16	2.00E-02	6.10E-02	0.40	1.22
2999	310.64	224.03	1.65E-02	6.09E-02	0.33	1.22
3000	310.44	223.92	1.29E-02	6.09E-02	0.26	1.22
3001	310.19	223.76	1.55E-02	6.09E-02	0.31	1.22
3002	310.03	223.66	1.16E-02	6.09E-02	0.23	1.22
3003	309.84	223.57	1.94E-02	6.09E-02	0.39	1.22
3004	309.64	223.42	2.47E-02	6.08E-02	0.49	1.22
3005	309.48	223.32	2.09E-02	6.08E-02	0.42	1.22
3006	309.29	223.20	1.15E-02	6.08E-02	0.23	1.22
3007	309.11	222.95	3.49E-02	6.08E-02	0.70	1.22
3008	308.91	222.79	2.19E-02	6.08E-02	0.44	1.22
3009	308.73	222.68	1.71E-02	6.07E-02	0.34	1.21
3010	308.52	222.57	1.94E-02	6.06E-02	0.39	1.21
3011	308.32	222.44	2.20E-02	6.07E-02	0.44	1.21
3012	308.13	222.33	1.81E-02	6.05E-02	0.36	1.21

3013	307.95	222.24	2.30E-02	6.06E-02	0.46	1.21
3014	307.73	222.10	1.74E-02	6.05E-02	0.35	1.21
3015	307.55	221.99	1.80E-02	6.05E-02	0.36	1.21
3016	307.34	221.88	2.20E-02	6.06E-02	0.44	1.21
3017	307.17	221.79	2.78E-02	6.05E-02	0.56	1.21
3018	306.92	221.67	1.68E-02	6.05E-02	0.34	1.21
3019	306.81	221.55	2.46E-02	6.04E-02	0.49	1.21
3020	306.61	221.44	1.89E-02	6.04E-02	0.38	1.21
3021	306.45	221.34	1.88E-02	6.04E-02	0.38	1.21
3022	306.18	221.25	2.42E-02	6.03E-02	0.48	1.21
3023	306.06	221.14	1.77E-02	6.03E-02	0.35	1.21
3024	305.89	221.04	2.25E-02	6.03E-02	0.45	1.21
3025	305.71	220.94	1.90E-02	6.03E-02	0.38	1.21
3026	305.50	220.85	1.96E-02	6.02E-02	0.39	1.20
3027	305.33	220.74	2.34E-02	6.01E-02	0.47	1.20
3028	305.13	220.64	2.32E-02	6.02E-02	0.46	1.20
3029	304.94	220.55	1.98E-02	6.01E-02	0.40	1.20
3030	304.77	220.45	2.27E-02	6.01E-02	0.45	1.20
3031	304.60	220.36	1.53E-02	6.01E-02	0.31	1.20
3032	304.40	220.24	2.60E-02	6.01E-02	0.52	1.20
3033	304.19	220.16	2.34E-02	6.00E-02	0.47	1.20
3034	304.06	220.06	2.13E-02	6.00E-02	0.43	1.20
3035	303.86	219.96	2.03E-02	5.99E-02	0.41	1.20
3036	303.67	219.84	2.57E-02	5.99E-02	0.51	1.20
3037	303.49	219.75	1.91E-02	5.98E-02	0.38	1.20
3038	303.30	219.62	2.58E-02	5.98E-02	0.52	1.20
3039	303.09	219.55	1.84E-02	5.98E-02	0.37	1.20
3040	302.88	219.46	1.33E-02	5.98E-02	0.27	1.20
3041	302.74	219.37	2.04E-02	5.98E-02	0.41	1.20
3042	302.56	219.26	2.02E-02	5.98E-02	0.40	1.20
3043	302.36	219.15	2.63E-02	5.97E-02	0.53	1.19
3044	302.20	219.08	2.20E-02	5.97E-02	0.44	1.19
3045	302.08	219.00	2.09E-02	5.97E-02	0.42	1.19
3046	301.84	218.91	3.14E-02	5.97E-02	0.63	1.19
3047	301.70	218.82	1.85E-02	5.96E-02	0.37	1.19
3048	301.50	218.73	1.32E-02	5.96E-02	0.26	1.19
3049	301.30	218.65	2.65E-02	5.96E-02	0.53	1.19
3050	301.16	218.57	2.07E-02	5.96E-02	0.41	1.19
3051	301.01	218.46	2.49E-02	5.97E-02	0.50	1.19
3052	300.78	218.40	1.80E-02	5.95E-02	0.36	1.19
3053	300.59	218.29	2.06E-02	5.95E-02	0.41	1.19
3054	300.38	218.22	1.77E-02	5.95E-02	0.35	1.19
3055	300.26	218.13	1.93E-02	5.94E-02	0.39	1.19
3056	300.07	218.03	1.58E-02	5.94E-02	0.32	1.19
3057	299.90	217.94	1.95E-02	5.94E-02	0.39	1.19
3058	299.71	217.86	1.78E-02	5.93E-02	0.36	1.19
3059	299.56	217.79	2.18E-02	5.93E-02	0.44	1.19
3060	299.38	217.72	2.25E-02	5.93E-02	0.45	1.19
3061	299.21	217.62	1.76E-02	5.93E-02	0.35	1.19
3062	299.07	217.53	2.06E-02	5.93E-02	0.41	1.19
3063	298.90	217.47	2.52E-02	5.93E-02	0.50	1.19
3064	298.76	217.38	2.62E-02	5.92E-02	0.52	1.18
3065	298.57	217.31	2.14E-02	5.92E-02	0.43	1.18
3066	298.40	217.23	1.72E-02	5.92E-02	0.34	1.18
3067	298.25	217.15	1.91E-02	5.92E-02	0.38	1.18
3068	298.09	217.06	2.16E-02	5.91E-02	0.43	1.18
3069	297.93	216.99	2.20E-02	5.91E-02	0.44	1.18
3070	297.74	216.92	2.17E-02	5.90E-02	0.43	1.18
3071	297.59	216.84	2.89E-02	5.90E-02	0.58	1.18
3072	297.43	216.79	2.53E-02	5.89E-02	0.51	1.18

3073	297.25	216.69	1.75E-02	5.89E-02	0.35	1.18
3074	297.12	216.63	1.77E-02	5.90E-02	0.35	1.18
3075	296.93	216.55	2.47E-02	5.89E-02	0.49	1.18
3076	296.73	216.47	1.92E-02	5.89E-02	0.38	1.18
3077	296.61	216.49	2.00E-02	5.89E-02	0.40	1.18
3078	296.46	216.32	1.87E-02	5.89E-02	0.37	1.18
3079	296.26	216.26	2.37E-02	5.89E-02	0.47	1.18
3080	296.15	216.18	2.48E-02	5.89E-02	0.50	1.18
3081	296.02	216.10	1.63E-02	5.87E-02	0.33	1.17
3082	295.82	216.02	2.36E-02	5.88E-02	0.47	1.18
3083	295.68	215.85	2.26E-02	5.88E-02	0.45	1.18
3084	295.46	215.63	1.91E-02	5.87E-02	0.38	1.17
3085	295.27	215.56	1.55E-02	5.86E-02	0.31	1.17
3086	295.07	215.49	2.59E-02	5.86E-02	0.52	1.17
3087	294.97	215.39	1.96E-02	5.86E-02	0.39	1.17
3088	294.87	215.32	2.12E-02	5.86E-02	0.42	1.17
3089	294.66	215.23	2.33E-02	5.86E-02	0.47	1.17
3090	294.55	215.16	1.62E-02	5.87E-02	0.32	1.17
3091	294.33	215.12	1.80E-02	5.86E-02	0.36	1.17
3092	294.12	215.04	2.28E-02	5.86E-02	0.46	1.17
3093	294.04	214.97	2.20E-02	5.86E-02	0.44	1.17
3094	293.91	214.93	2.47E-02	5.87E-02	0.49	1.17
3095	293.75	214.84	1.86E-02	5.86E-02	0.37	1.17
3096	293.64	214.77	1.62E-02	5.86E-02	0.32	1.17
3097	293.50	214.69	2.27E-02	5.85E-02	0.45	1.17
3098	293.33	214.64	2.75E-02	5.84E-02	0.55	1.17
3099	293.20	214.59	1.66E-02	5.84E-02	0.33	1.17
3100	293.03	214.52	2.18E-02	5.84E-02	0.44	1.17
3101	292.93	214.45	1.72E-02	5.84E-02	0.34	1.17
3102	292.77	214.40	1.73E-02	5.84E-02	0.35	1.17
3103	292.67	214.33	2.30E-02	5.83E-02	0.46	1.17
3104	292.51	214.28	2.77E-02	5.84E-02	0.55	1.17
3105	292.42	214.20	2.80E-02	5.83E-02	0.56	1.17
3106	292.22	214.15	1.24E-02	5.83E-02	0.25	1.17
3107	292.13	214.09	3.07E-02	5.82E-02	0.61	1.16
3108	291.98	214.03	2.32E-02	5.83E-02	0.46	1.17
3109	291.85	213.95	1.95E-02	5.83E-02	0.39	1.17
3110	291.70	213.89	2.61E-02	5.83E-02	0.52	1.17
3111	291.55	213.84	2.20E-02	5.82E-02	0.44	1.16
3112	291.46	213.80	1.19E-02	5.82E-02	0.24	1.16
3113	291.33	213.76	2.54E-02	5.82E-02	0.51	1.16
3114	291.18	213.70	1.37E-02	5.81E-02	0.27	1.16
3115	291.07	213.67	1.74E-02	5.81E-02	0.35	1.16
3116	290.93	213.63	1.58E-02	5.81E-02	0.32	1.16
3117	290.81	213.58	2.61E-02	5.80E-02	0.52	1.16
3118	290.66	213.53	1.96E-02	5.81E-02	0.39	1.16
3119	290.49	213.48	2.46E-02	5.81E-02	0.49	1.16
3120	290.40	213.46	1.94E-02	5.81E-02	0.39	1.16
3121	290.27	213.42	7.34E-03	5.81E-02	0.15	1.16
3122	290.13	213.39	2.35E-02	5.80E-02	0.47	1.16
3123	289.99	213.35	2.81E-02	5.81E-02	0.56	1.16
3124	289.86	213.29	2.51E-02	5.80E-02	0.50	1.16
3125	289.70	213.25	2.40E-02	5.79E-02	0.48	1.16
3126	289.57	213.28	1.78E-02	5.80E-02	0.36	1.16
3127	289.44	213.14	2.01E-02	5.79E-02	0.40	1.16
3128	289.34	213.10	1.57E-02	5.79E-02	0.31	1.16
3129	289.21	213.05	1.84E-02	5.79E-02	0.37	1.16
3130	289.04	213.02	2.35E-02	5.79E-02	0.47	1.16
3131	288.93	212.98	1.58E-02	5.78E-02	0.32	1.16
3132	288.81	212.92	2.59E-02	5.78E-02	0.52	1.16

3133	288.66	212.87	2.22E-02	5.78E-02	0.44	1.16
3134	288.54	212.86	2.61E-02	5.78E-02	0.52	1.16
3135	288.44	212.81	1.94E-02	5.77E-02	0.39	1.15
3136	288.31	212.73	9.53E-03	5.77E-02	0.19	1.15
3137	288.21	212.74	2.55E-02	5.77E-02	0.51	1.15
3138	288.08	212.72	2.31E-02	5.78E-02	0.46	1.16
3139	287.95	212.67	1.80E-02	5.77E-02	0.36	1.15
3140	287.84	212.65	2.34E-02	5.77E-02	0.47	1.15
3141	287.73	212.60	2.03E-02	5.76E-02	0.41	1.15
3142	287.62	212.57	2.21E-02	5.76E-02	0.44	1.15
3143	287.51	212.51	1.74E-02	5.75E-02	0.35	1.15
3144	287.37	212.47	2.24E-02	5.76E-02	0.45	1.15
3145	287.23	212.51	2.28E-02	5.76E-02	0.46	1.15
3146	287.09	212.41	1.51E-02	5.75E-02	0.30	1.15
3147	286.97	212.36	1.94E-02	5.75E-02	0.39	1.15
3148	286.85	212.32	2.21E-02	5.76E-02	0.44	1.15
3149	286.73	212.30	2.21E-02	5.75E-02	0.44	1.15
3150	286.65	212.26	2.61E-02	5.75E-02	0.52	1.15
3151	286.51	212.21	2.35E-02	5.75E-02	0.47	1.15
3152	286.39	212.19	1.20E-02	5.74E-02	0.24	1.15
3153	286.34	212.14	2.63E-02	5.75E-02	0.53	1.15
3154	286.28	212.13	2.37E-02	5.75E-02	0.47	1.15
3155	286.09	212.07	2.75E-02	5.75E-02	0.55	1.15
3156	285.98	212.04	1.52E-02	5.74E-02	0.30	1.15
3157	285.91	211.99	2.76E-02	5.74E-02	0.55	1.15
3158	285.82	212.02	2.47E-02	5.73E-02	0.49	1.15
3159	285.68	211.98	2.09E-02	5.73E-02	0.42	1.15
3160	285.60	211.95	1.78E-02	5.73E-02	0.36	1.15
3161	285.46	211.92	3.01E-02	5.73E-02	0.60	1.15
3162	285.37	211.93	1.73E-02	5.73E-02	0.35	1.15
3163	285.28	211.90	1.37E-02	5.73E-02	0.27	1.15
3164	285.19	211.88	2.20E-02	5.72E-02	0.44	1.14
3165	285.10	211.84	1.91E-02	5.73E-02	0.38	1.15
3166	284.98	211.81	1.85E-02	5.73E-02	0.37	1.15
3167	284.87	211.76	2.64E-02	5.73E-02	0.53	1.15
3168	284.75	211.70	2.54E-02	5.73E-02	0.51	1.15
3169	284.63	211.70	1.82E-02	5.73E-02	0.36	1.15
3170	284.58	211.69	2.60E-02	5.72E-02	0.52	1.14
3171	284.44	211.65	2.20E-02	5.72E-02	0.44	1.14
3172	284.29	211.62	1.18E-02	5.72E-02	0.24	1.14
3173	284.20	211.59	2.35E-02	5.72E-02	0.47	1.14
3174	284.09	211.57	2.09E-02	5.71E-02	0.42	1.14
3175	284.04	211.54	2.82E-02	5.72E-02	0.56	1.14
3176	283.94	211.52	2.19E-02	5.71E-02	0.44	1.14
3177	283.85	211.53	2.29E-02	5.71E-02	0.46	1.14
3178	283.75	211.49	2.21E-02	5.72E-02	0.44	1.14
3179	283.65	211.46	2.63E-02	5.71E-02	0.53	1.14
3180	283.54	211.46	9.93E-03	5.71E-02	0.20	1.14
3181	283.48	211.43	2.17E-02	5.71E-02	0.43	1.14
3182	283.36	211.41	2.18E-02	5.71E-02	0.44	1.14
3183	283.26	211.37	2.21E-02	5.71E-02	0.44	1.14
3184	283.16	211.34	1.17E-02	5.70E-02	0.23	1.14
3185	283.11	211.32	2.63E-02	5.70E-02	0.53	1.14
3186	282.96	211.30	1.99E-02	5.70E-02	0.40	1.14
3187	282.86	211.28	3.38E-02	5.70E-02	0.68	1.14
3188	282.79	211.24	1.40E-02	5.69E-02	0.28	1.14
3189	282.70	211.30	3.25E-02	5.69E-02	0.65	1.14
3190	282.60	211.21	1.80E-02	5.69E-02	0.36	1.14
3191	282.49	211.18	1.61E-02	5.69E-02	0.32	1.14
3192	282.40	211.17	1.74E-02	5.69E-02	0.35	1.14

3193	282.26	211.15	3.32E-02	5.68E-02	0.66	1.14
3194	282.15	211.14	1.21E-02	5.69E-02	0.24	1.14
3195	282.04	211.13	2.67E-02	5.69E-02	0.53	1.14
3196	281.99	211.12	2.57E-02	5.69E-02	0.51	1.14
3197	281.89	211.08	2.12E-02	5.69E-02	0.42	1.14
3198	281.82	211.09	1.68E-02	5.69E-02	0.34	1.14
3199	281.75	211.05	2.23E-02	5.68E-02	0.45	1.14
3200	281.60	211.02	1.61E-02	5.69E-02	0.32	1.14
3201	281.65	211.02	2.91E-02	5.69E-02	0.58	1.14
3202	281.49	211.00	2.45E-02	5.69E-02	0.49	1.14
3203	281.36	210.99	2.14E-02	5.68E-02	0.43	1.14
3204	281.34	210.98	1.05E-02	5.68E-02	0.21	1.14
3205	281.20	210.94	2.27E-02	5.68E-02	0.45	1.14
3206	281.13	210.92	1.73E-02	5.68E-02	0.35	1.14
3207	281.04	210.92	2.00E-02	5.67E-02	0.40	1.13
3208	280.95	211.07	1.71E-02	5.67E-02	0.34	1.13
3209	280.85	210.92	2.41E-02	5.68E-02	0.48	1.14
3210	280.77	210.88	2.10E-02	5.67E-02	0.42	1.13
3211	280.71	210.89	2.02E-02	5.68E-02	0.40	1.14
3212	280.63	210.89	2.33E-02	5.68E-02	0.47	1.14
3213	280.55	210.87	2.01E-02	5.67E-02	0.40	1.13
3214	280.47	210.85	2.16E-02	5.68E-02	0.43	1.14
3215	280.40	210.86	2.75E-02	5.66E-02	0.55	1.13
3216	280.32	210.85	1.33E-02	5.67E-02	0.27	1.13
3217	280.26	210.83	1.50E-02	5.66E-02	0.30	1.13
3218	280.17	210.82	2.22E-02	5.66E-02	0.44	1.13
3219	280.11	210.82	2.30E-02	5.66E-02	0.46	1.13
3220	280.04	210.81	1.55E-02	5.66E-02	0.31	1.13
3221	279.96	210.80	1.60E-02	5.66E-02	0.32	1.13
3222	279.87	210.78	1.88E-02	5.66E-02	0.38	1.13
3223	279.85	210.79	1.63E-02	5.66E-02	0.33	1.13
3224	279.75	210.79	2.47E-02	5.66E-02	0.49	1.13
3225	279.68	210.78	2.05E-02	5.66E-02	0.41	1.13
3226	279.59	210.76	2.11E-02	5.66E-02	0.42	1.13
3227	279.48	210.78	1.28E-02	5.67E-02	0.26	1.13
3228	279.38	210.75	2.12E-02	5.66E-02	0.42	1.13
3229	279.28	210.77	2.56E-02	5.66E-02	0.51	1.13
3230	279.16	210.76	2.24E-02	5.65E-02	0.45	1.13
3231	279.09	210.76	2.13E-02	5.65E-02	0.43	1.13
3232	278.99	210.72	1.82E-02	5.64E-02	0.36	1.13
3233	278.93	210.73	1.22E-02	5.64E-02	0.24	1.13
3234	278.85	210.72	2.62E-02	5.64E-02	0.52	1.13
3235	278.79	210.70	2.15E-02	5.64E-02	0.43	1.13
3236	278.72	210.73	2.40E-02	5.65E-02	0.48	1.13
3237	278.59	210.70	1.41E-02	5.64E-02	0.28	1.13
3238	278.53	210.71	2.43E-02	5.64E-02	0.49	1.13
3239	278.46	210.71	1.79E-02	5.64E-02	0.36	1.13
3240	278.38	210.70	2.01E-02	5.64E-02	0.40	1.13
3241	278.30	210.70	1.67E-02	5.64E-02	0.33	1.13
3242	278.28	210.69	1.76E-02	5.65E-02	0.35	1.13
3243	278.17	210.72	2.07E-02	5.64E-02	0.41	1.13
3244	278.13	210.69	1.91E-02	5.64E-02	0.38	1.13
3245	278.00	210.70	2.15E-02	5.64E-02	0.43	1.13
3246	277.93	210.66	1.88E-02	5.63E-02	0.38	1.13
3247	277.89	210.68	2.46E-02	5.63E-02	0.49	1.13
3248	277.72	210.65	2.16E-02	5.63E-02	0.43	1.13
3249	277.69	210.65	1.88E-02	5.63E-02	0.38	1.13
3250	277.59	210.66	1.96E-02	5.63E-02	0.39	1.13
3251	277.55	210.65	1.52E-02	5.62E-02	0.30	1.12
3252	277.46	210.64	1.81E-02	5.62E-02	0.36	1.12

3253	277.42	210.66	2.05E-02	5.62E-02	0.41	1.12
3254	277.34	210.67	1.82E-02	5.63E-02	0.36	1.13
3255	277.24	210.66	2.71E-02	5.62E-02	0.54	1.12
3256	277.20	210.67	1.95E-02	5.61E-02	0.39	1.12
3257	277.15	210.64	1.94E-02	5.62E-02	0.39	1.12
3258	277.05	210.66	2.58E-02	5.62E-02	0.52	1.12
3259	276.97	210.66	2.01E-02	5.61E-02	0.40	1.12
3260	276.96	210.68	1.87E-02	5.61E-02	0.37	1.12
3261	276.90	210.66	1.13E-02	5.61E-02	0.23	1.12
3262	276.83	210.65	2.34E-02	5.61E-02	0.47	1.12
3263	276.73	210.65	2.75E-02	5.61E-02	0.55	1.12
3264	276.76	210.68	1.54E-02	5.61E-02	0.31	1.12
3265	276.63	210.67	1.82E-02	5.61E-02	0.36	1.12
3266	276.61	210.66	1.67E-02	5.61E-02	0.33	1.12
3267	276.52	210.69	2.31E-02	5.61E-02	0.46	1.12
3268	276.48	210.67	1.63E-02	5.61E-02	0.33	1.12
3269	276.32	210.70	2.18E-02	5.61E-02	0.44	1.12
3270	276.32	210.70	1.70E-02	5.60E-02	0.34	1.12
3271	276.23	210.67	2.04E-02	5.61E-02	0.41	1.12
3272	276.21	210.68	1.64E-02	5.61E-02	0.33	1.12
3273	276.15	210.71	2.03E-02	5.60E-02	0.41	1.12
3274	276.06	210.71	1.69E-02	5.61E-02	0.34	1.12
3275	276.01	210.71	2.51E-02	5.60E-02	0.50	1.12
3276	275.91	210.72	2.21E-02	5.60E-02	0.44	1.12
3277	275.81	210.71	1.59E-02	5.60E-02	0.32	1.12
3278	275.80	210.72	2.33E-02	5.60E-02	0.47	1.12
3279	275.75	210.71	1.75E-02	5.60E-02	0.35	1.12
3280	275.69	210.72	2.15E-02	5.59E-02	0.43	1.12
3281	275.61	210.73	1.98E-02	5.59E-02	0.40	1.12
3282	275.57	210.74	1.92E-02	5.59E-02	0.38	1.12
3283	275.57	210.76	2.86E-02	5.59E-02	0.57	1.12
3284	275.44	210.75	2.61E-02	5.59E-02	0.52	1.12
3285	275.46	210.77	1.79E-02	5.59E-02	0.36	1.12
3286	275.33	210.78	2.20E-02	5.59E-02	0.44	1.12
3287	275.34	210.78	2.21E-02	5.59E-02	0.44	1.12
3288	275.28	210.79	1.80E-02	5.59E-02	0.36	1.12
3289	275.26	210.81	2.58E-02	5.58E-02	0.52	1.12
3290	275.22	210.81	1.94E-02	5.58E-02	0.39	1.12
3291	275.21	210.81	2.16E-02	5.58E-02	0.43	1.12
3292	275.09	210.82	1.40E-02	5.57E-02	0.28	1.11
3293	275.11	210.84	2.28E-02	5.58E-02	0.46	1.12
3294	275.00	210.84	1.88E-02	5.58E-02	0.38	1.12
3295	275.01	210.84	2.65E-02	5.58E-02	0.53	1.12
3296	274.99	210.87	2.16E-02	5.58E-02	0.43	1.12
3297	274.88	210.86	1.31E-02	5.58E-02	0.26	1.12
3298	274.84	210.87	1.89E-02	5.58E-02	0.38	1.12
3299	274.79	210.88	1.55E-02	5.58E-02	0.31	1.12
3300	274.74	210.87	2.00E-02	5.58E-02	0.40	1.12
3301	274.68	210.92	2.67E-02	5.58E-02	0.53	1.12
3302	274.66	210.93	1.64E-02	5.58E-02	0.33	1.12
3303	274.57	210.97	2.61E-02	5.58E-02	0.52	1.12
3304	274.52	210.97	2.16E-02	5.57E-02	0.43	1.11
3305	274.45	210.97	1.76E-02	5.57E-02	0.35	1.11
3306	274.43	211.00	2.99E-02	5.58E-02	0.60	1.12
3307	274.38	211.00	1.38E-02	5.57E-02	0.28	1.11
3308	274.31	211.03	1.75E-02	5.57E-02	0.35	1.11
3309	274.26	211.05	2.07E-02	5.56E-02	0.41	1.11
3310	274.24	211.06	2.65E-02	5.57E-02	0.53	1.11
3311	274.14	211.07	1.70E-02	5.57E-02	0.34	1.11
3312	274.04	211.07	1.69E-02	5.57E-02	0.34	1.11

3313	274.07	211.08	2.33E-02	5.57E-02	0.47	1.11
3314	274.06	211.12	1.70E-02	5.57E-02	0.34	1.11
3315	274.01	211.13	1.42E-02	5.57E-02	0.28	1.11
3316	273.91	211.12	2.54E-02	5.56E-02	0.51	1.11
3317	273.93	211.15	3.00E-02	5.56E-02	0.60	1.11
3318	273.89	211.16	1.86E-02	5.56E-02	0.37	1.11
3319	273.76	211.18	1.57E-02	5.56E-02	0.31	1.11
3320	273.66	211.22	1.70E-02	5.55E-02	0.34	1.11
3321	273.75	211.22	1.75E-02	5.55E-02	0.35	1.11
3322	273.66	211.22	1.99E-02	5.55E-02	0.40	1.11
3323	273.75	211.24	2.17E-02	5.55E-02	0.43	1.11
3324	273.65	211.29	1.89E-02	5.56E-02	0.38	1.11
3325	273.55	211.30	1.93E-02	5.55E-02	0.39	1.11
3326	273.62	211.34	2.08E-02	5.56E-02	0.42	1.11
3327	273.61	211.37	1.63E-02	5.56E-02	0.33	1.11
3328	273.52	211.37	1.35E-02	5.55E-02	0.27	1.11
3329	273.46	211.43	1.55E-02	5.55E-02	0.31	1.11
3330	273.52	211.45	1.42E-02	5.55E-02	0.28	1.11
3331	273.46	211.48	2.35E-02	5.54E-02	0.47	1.11
3332	273.39	211.48	2.00E-02	5.54E-02	0.40	1.11
3333	273.40	211.50	1.37E-02	5.53E-02	0.27	1.11
3334	273.38	211.51	2.16E-02	5.53E-02	0.43	1.11
3335	273.27	211.51	9.89E-03	5.53E-02	0.20	1.11
3336	273.29	211.53	3.28E-02	5.53E-02	0.66	1.11
3337	273.23	211.58	1.89E-02	5.53E-02	0.38	1.11
3338	273.23	211.59	1.72E-02	5.53E-02	0.34	1.11
3339	273.19	211.59	2.62E-02	5.53E-02	0.52	1.11
3340	273.14	211.61	1.87E-02	5.53E-02	0.37	1.11
3341	273.11	211.63	2.04E-02	5.53E-02	0.41	1.11
3342	273.08	211.68	2.09E-02	5.53E-02	0.42	1.11
3343	273.06	211.69	2.38E-02	5.53E-02	0.48	1.11
3344	272.98	211.72	1.70E-02	5.53E-02	0.34	1.11
3345	273.05	211.74	1.81E-02	5.54E-02	0.36	1.11
3346	273.04	211.77	2.42E-02	5.53E-02	0.48	1.11
3347	272.96	211.79	2.10E-02	5.52E-02	0.42	1.10
3348	272.90	211.79	2.30E-02	5.52E-02	0.46	1.10
3349	272.87	211.83	3.12E-02	5.52E-02	0.62	1.10
3350	272.80	211.87	1.35E-02	5.51E-02	0.27	1.10
3351	272.81	211.85	1.65E-02	5.52E-02	0.33	1.10
3352	272.75	211.87	2.77E-02	5.52E-02	0.55	1.10
3353	272.79	211.88	2.34E-02	5.51E-02	0.47	1.10
3354	272.77	211.91	3.00E-02	5.52E-02	0.60	1.10
3355	272.73	211.95	1.20E-02	5.52E-02	0.24	1.10
3356	272.68	212.16	2.59E-02	5.51E-02	0.52	1.10
3357	272.67	212.18	2.33E-02	5.51E-02	0.47	1.10
3358	272.66	212.17	1.62E-02	5.51E-02	0.32	1.10
3359	272.69	212.19	2.31E-02	5.52E-02	0.46	1.10
3360	272.63	212.22	1.90E-02	5.51E-02	0.38	1.10
3361	272.68	212.22	1.75E-02	5.52E-02	0.35	1.10
3362	272.61	212.23	2.13E-02	5.51E-02	0.43	1.10
3363	272.57	212.28	2.38E-02	5.52E-02	0.48	1.10
3364	272.55	212.30	1.96E-02	5.51E-02	0.39	1.10
3365	272.53	212.35	2.25E-02	5.51E-02	0.45	1.10
3366	272.54	212.37	1.84E-02	5.51E-02	0.37	1.10
3367	272.53	212.40	2.77E-02	5.50E-02	0.55	1.10
3368	272.47	212.45	2.44E-02	5.50E-02	0.49	1.10
3369	272.48	212.49	8.82E-03	5.51E-02	0.18	1.10
3370	272.43	212.55	1.68E-02	5.51E-02	0.34	1.10
3371	272.34	212.52	2.49E-02	5.51E-02	0.50	1.10
3372	272.37	212.54	2.07E-02	5.51E-02	0.41	1.10

3373	272.37	212.59	1.68E-02	5.51E-02	0.34	1.10
3374	272.34	212.59	1.23E-02	5.51E-02	0.25	1.10
3375	272.36	212.60	2.27E-02	5.50E-02	0.45	1.10
3376	272.30	212.65	1.84E-02	5.50E-02	0.37	1.10
3377	272.24	212.64	2.12E-02	5.50E-02	0.42	1.10
3378	272.20	212.68	1.94E-02	5.49E-02	0.39	1.10
3379	272.25	212.69	2.10E-02	5.49E-02	0.42	1.10
3380	272.22	212.72	1.52E-02	5.50E-02	0.30	1.10
3381	272.25	212.74	1.61E-02	5.49E-02	0.32	1.10
3382	272.20	212.80	2.98E-02	5.50E-02	0.60	1.10
3383	272.18	212.83	1.36E-02	5.49E-02	0.27	1.10
3384	272.24	212.82	1.95E-02	5.49E-02	0.39	1.10
3385	272.23	212.87	2.11E-02	5.50E-02	0.42	1.10
3386	272.23	212.90	2.51E-02	5.49E-02	0.50	1.10
3387	272.23	212.94	1.34E-02	5.48E-02	0.27	1.10
3388	272.22	213.00	2.03E-02	5.48E-02	0.41	1.10
3389	272.18	213.00	1.61E-02	5.49E-02	0.32	1.10
3390	272.16	213.05	2.42E-02	5.48E-02	0.48	1.10
3391	272.12	213.08	1.64E-02	5.47E-02	0.33	1.09
3392	272.06	213.09	2.48E-02	5.47E-02	0.50	1.09
3393	272.03	213.14	1.94E-02	5.48E-02	0.39	1.10
3394	272.00	213.16	1.68E-02	5.47E-02	0.34	1.09
3395	272.00	213.21	1.71E-02	5.47E-02	0.34	1.09
3396	271.94	213.25	1.41E-02	5.47E-02	0.28	1.09
3397	271.95	213.28	2.40E-02	5.47E-02	0.48	1.09
3398	271.89	213.32	2.07E-02	5.47E-02	0.41	1.09
3399	271.87	213.34	2.72E-02	5.47E-02	0.54	1.09
3400	271.86	213.34	1.50E-02	5.47E-02	0.30	1.09
3401	271.86	213.41	2.19E-02	5.47E-02	0.44	1.09
3402	271.83	213.45	1.86E-02	5.47E-02	0.37	1.09
3403	271.81	213.47	1.82E-02	5.47E-02	0.36	1.09
3404	271.83	213.50	9.20E-03	5.47E-02	0.18	1.09
3405	271.75	213.53	2.21E-02	5.47E-02	0.44	1.09
3406	271.75	213.59	9.52E-03	5.47E-02	0.19	1.09
3407	271.79	213.62	2.13E-02	5.46E-02	0.43	1.09
3408	271.77	213.64	1.61E-02	5.46E-02	0.32	1.09
3409	271.72	213.65	1.96E-02	5.46E-02	0.39	1.09
3410	271.67	213.67	2.27E-02	5.46E-02	0.45	1.09
3411	271.67	213.73	1.22E-02	5.46E-02	0.24	1.09
3412	271.66	213.76	2.01E-02	5.46E-02	0.40	1.09
3413	271.68	213.77	2.91E-02	5.45E-02	0.58	1.09
3414	271.65	213.81	1.52E-02	5.46E-02	0.30	1.09
3415	271.64	213.86	2.02E-02	5.46E-02	0.40	1.09
3416	271.66	213.88	1.64E-02	5.46E-02	0.33	1.09
3417	271.58	213.91	2.07E-02	5.46E-02	0.41	1.09
3418	271.52	213.94	2.22E-02	5.46E-02	0.44	1.09
3419	271.52	213.97	1.80E-02	5.46E-02	0.36	1.09
3420	271.52	214.02	2.65E-02	5.45E-02	0.53	1.09
3421	271.51	214.03	2.84E-02	5.45E-02	0.57	1.09
3422	271.50	214.06	2.15E-02	5.46E-02	0.43	1.09
3423	271.50	214.09	2.05E-02	5.45E-02	0.41	1.09
3424	271.42	214.13	2.56E-02	5.46E-02	0.51	1.09
3425	271.47	214.16	2.07E-02	5.46E-02	0.41	1.09
3426	271.45	214.19	2.27E-02	5.45E-02	0.45	1.09
3427	271.49	214.22	1.92E-02	5.45E-02	0.38	1.09
3428	271.45	214.25	2.31E-02	5.45E-02	0.46	1.09
3429	271.45	214.27	2.08E-02	5.45E-02	0.42	1.09
3430	271.48	214.32	1.63E-02	5.45E-02	0.33	1.09
3431	271.43	214.34	2.09E-02	5.45E-02	0.42	1.09
3432	271.43	214.41	2.63E-02	5.45E-02	0.53	1.09

3433	271.44	214.44	2.88E-02	5.45E-02	0.58	1.09
3434	271.45	214.47	1.83E-02	5.45E-02	0.37	1.09
3435	271.48	214.52	2.44E-02	5.45E-02	0.49	1.09
3436	271.47	214.50	2.78E-02	5.44E-02	0.56	1.09
3437	271.46	214.61	1.78E-02	5.44E-02	0.36	1.09
3438	271.47	214.64	2.01E-02	5.45E-02	0.40	1.09
3439	271.46	214.66	2.43E-02	5.45E-02	0.49	1.09
3440	271.48	214.72	2.75E-02	5.44E-02	0.55	1.09
3441	271.49	214.76	1.79E-02	5.44E-02	0.36	1.09
3442	271.45	214.78	2.45E-02	5.44E-02	0.49	1.09
3443	271.48	214.82	1.53E-02	5.44E-02	0.31	1.09
3444	271.47	214.86	1.94E-02	5.44E-02	0.39	1.09
3445	271.43	214.87	1.75E-02	5.44E-02	0.35	1.09
3446	271.44	214.93	1.80E-02	5.44E-02	0.36	1.09
3447	271.42	214.98	1.92E-02	5.44E-02	0.38	1.09
3448	271.43	214.99	2.10E-02	5.43E-02	0.42	1.09
3449	271.37	215.05	2.36E-02	5.43E-02	0.47	1.09
3450	271.40	215.08	2.28E-02	5.43E-02	0.46	1.09
3451	271.38	215.09	2.14E-02	5.43E-02	0.43	1.09
3452	271.38	215.14	1.41E-02	5.43E-02	0.28	1.09
3453	271.40	215.16	2.12E-02	5.42E-02	0.42	1.08
3454	271.40	215.21	2.30E-02	5.43E-02	0.46	1.09
3455	271.39	215.35	2.72E-02	5.43E-02	0.54	1.09
3456	271.39	215.41	2.52E-02	5.42E-02	0.50	1.08
3457	271.35	215.45	1.63E-02	5.42E-02	0.33	1.08
3458	271.35	215.48	2.31E-02	5.42E-02	0.46	1.08
3459	271.42	215.52	1.45E-02	5.42E-02	0.29	1.08
3460	271.44	215.56	3.09E-02	5.41E-02	0.62	1.08
3461	271.40	215.58	2.42E-02	5.42E-02	0.48	1.08
3462	271.40	215.62	1.58E-02	5.42E-02	0.32	1.08
3463	271.40	215.56	2.37E-02	5.42E-02	0.47	1.08
3464	271.39	215.65	1.72E-02	5.42E-02	0.34	1.08
3465	271.39	215.72	1.55E-02	5.41E-02	0.31	1.08
3466	271.42	215.73	2.61E-02	5.41E-02	0.52	1.08
3467	271.44	215.76	2.06E-02	5.41E-02	0.41	1.08
3468	271.47	215.78	1.53E-02	5.40E-02	0.31	1.08
3469	271.46	215.85	1.52E-02	5.41E-02	0.30	1.08
3470	271.51	215.88	2.73E-02	5.41E-02	0.55	1.08
3471	271.45	215.95	1.87E-02	5.41E-02	0.37	1.08
3472	271.44	215.96	1.69E-02	5.41E-02	0.34	1.08
3473	271.47	216.00	2.10E-02	5.41E-02	0.42	1.08
3474	271.45	216.04	2.02E-02	5.40E-02	0.40	1.08
3475	271.45	216.07	1.40E-02	5.40E-02	0.28	1.08
3476	271.45	216.12	2.02E-02	5.40E-02	0.40	1.08
3477	271.46	216.14	1.60E-02	5.40E-02	0.32	1.08
3478	271.47	216.18	2.29E-02	5.40E-02	0.46	1.08
3479	271.48	216.22	1.22E-02	5.40E-02	0.24	1.08
3480	271.38	216.25	2.91E-02	5.39E-02	0.58	1.08
3481	271.42	216.28	2.77E-02	5.39E-02	0.55	1.08
3482	271.41	216.33	2.44E-02	5.39E-02	0.49	1.08
3483	271.41	216.34	1.79E-02	5.39E-02	0.36	1.08
3484	271.46	216.36	1.26E-02	5.40E-02	0.25	1.08
3485	271.45	216.40	2.68E-02	5.40E-02	0.54	1.08
3486	271.47	216.45	2.58E-02	5.40E-02	0.52	1.08
3487	271.43	216.48	2.10E-02	5.40E-02	0.42	1.08
3488	271.38	216.53	2.99E-02	5.39E-02	0.60	1.08
3489	271.52	216.55	1.79E-02	5.40E-02	0.36	1.08
3490	271.47	216.59	2.52E-02	5.40E-02	0.50	1.08
3491	271.45	216.63	2.31E-02	5.39E-02	0.46	1.08
3492	271.48	216.64	1.83E-02	5.39E-02	0.37	1.08

3493	271.57	216.68	1.92E-02	5.39E-02	0.38	1.08
3494	271.54	216.72	1.93E-02	5.39E-02	0.39	1.08
3495	271.59	216.76	1.75E-02	5.38E-02	0.35	1.08
3496	271.59	216.80	2.08E-02	5.38E-02	0.42	1.08
3497	271.61	216.86	2.34E-02	5.38E-02	0.47	1.08
3498	271.62	216.91	1.88E-02	5.38E-02	0.38	1.08
3499	271.65	216.95	1.13E-02	5.38E-02	0.23	1.08
3500	271.67	217.02	2.54E-02	5.38E-02	0.51	1.08
3501	271.67	217.03	2.08E-02	5.38E-02	0.42	1.08
3502	271.74	217.13	2.63E-02	5.38E-02	0.53	1.08
3503	271.78	217.17	2.74E-02	5.38E-02	0.55	1.08
3504	271.79	217.24	1.83E-02	5.38E-02	0.37	1.08
3505	271.82	217.28	1.99E-02	5.38E-02	0.40	1.08
3506	271.85	217.34	1.61E-02	5.37E-02	0.32	1.07
3507	271.85	217.39	1.82E-02	5.37E-02	0.36	1.07
3508	271.89	217.43	2.44E-02	5.36E-02	0.49	1.07
3509	271.93	217.47	2.29E-02	5.37E-02	0.46	1.07
3510	271.90	217.53	2.89E-02	5.37E-02	0.58	1.07
3511	271.84	217.56	1.90E-02	5.36E-02	0.38	1.07
3512	271.89	217.59	2.13E-02	5.36E-02	0.43	1.07
3513	271.90	217.65	2.11E-02	5.36E-02	0.42	1.07
3514	271.91	217.71	1.95E-02	5.36E-02	0.39	1.07
3515	271.96	217.75	2.55E-02	5.36E-02	0.51	1.07
3516	271.94	217.80	2.28E-02	5.36E-02	0.46	1.07
3517	271.95	217.84	1.98E-02	5.36E-02	0.40	1.07
3518	271.96	217.87	1.78E-02	5.36E-02	0.36	1.07
3519	272.00	217.91	2.40E-02	5.37E-02	0.48	1.07
3520	272.02	217.95	1.62E-02	5.37E-02	0.32	1.07
3521	272.01	218.00	1.77E-02	5.36E-02	0.35	1.07
3522	272.03	218.06	1.98E-02	5.36E-02	0.40	1.07
3523	272.07	218.09	2.82E-02	5.36E-02	0.56	1.07
3524	272.07	218.13	2.56E-02	5.35E-02	0.51	1.07
3525	272.09	218.17	2.47E-02	5.35E-02	0.49	1.07
3526	272.06	218.22	3.01E-02	5.35E-02	0.60	1.07
3527	272.09	218.26	1.22E-02	5.36E-02	0.24	1.07
3528	272.07	218.31	2.31E-02	5.35E-02	0.46	1.07
3529	272.07	218.35	1.80E-02	5.35E-02	0.36	1.07
3530	272.09	218.40	2.54E-02	5.35E-02	0.51	1.07
3531	272.14	218.42	2.23E-02	5.35E-02	0.45	1.07
3532	272.12	218.50	2.20E-02	5.36E-02	0.44	1.07
3533	272.11	218.52	2.46E-02	5.35E-02	0.49	1.07
3534	272.15	218.58	1.16E-02	5.35E-02	0.23	1.07
3535	272.11	218.62	1.91E-02	5.35E-02	0.38	1.07
3536	272.23	218.67	2.27E-02	5.35E-02	0.45	1.07
3537	272.09	218.72	1.79E-02	5.34E-02	0.36	1.07
3538	272.19	218.74	2.39E-02	5.34E-02	0.48	1.07
3539	272.22	218.80	2.11E-02	5.34E-02	0.42	1.07
3540	272.17	218.84	2.00E-02	5.34E-02	0.40	1.07
3541	272.21	218.89	2.33E-02	5.34E-02	0.47	1.07
3542	272.25	218.92	2.23E-02	5.34E-02	0.45	1.07
3543	272.29	218.99	1.65E-02	5.34E-02	0.33	1.07
3544	272.27	219.04	1.72E-02	5.34E-02	0.34	1.07
3545	272.28	219.08	1.71E-02	5.34E-02	0.34	1.07
3546	272.32	219.14	2.20E-02	5.34E-02	0.44	1.07
3547	272.38	219.18	2.04E-02	5.33E-02	0.41	1.07
3548	272.38	219.22	3.09E-02	5.33E-02	0.62	1.07
3549	272.32	219.29	1.74E-02	5.34E-02	0.35	1.07
3550	272.33	219.33	1.80E-02	5.33E-02	0.36	1.07
3551	272.32	219.38	1.08E-02	5.33E-02	0.22	1.07
3552	272.43	219.42	3.04E-02	5.33E-02	0.61	1.07

3553	272.44	219.46	2.44E-02	5.32E-02	0.49	1.06
3554	272.57	219.50	1.50E-02	5.32E-02	0.30	1.06
3555	272.57	219.55	1.59E-02	5.33E-02	0.32	1.07
3556	272.57	219.59	2.87E-02	5.32E-02	0.57	1.06
3557	272.58	219.62	2.76E-02	5.33E-02	0.55	1.07
3558	272.59	219.69	1.74E-02	5.32E-02	0.35	1.06
3559	272.60	219.73	1.61E-02	5.32E-02	0.32	1.06
3560	272.60	219.79	2.19E-02	5.32E-02	0.44	1.06
3561	272.65	219.82	2.37E-02	5.32E-02	0.47	1.06
3562	272.68	219.86	1.17E-02	5.32E-02	0.23	1.06
3563	272.77	219.90	2.30E-02	5.32E-02	0.46	1.06
3564	272.76	219.94	1.88E-02	5.32E-02	0.38	1.06
3565	272.77	220.00	2.14E-02	5.31E-02	0.43	1.06
3566	272.77	220.05	1.65E-02	5.31E-02	0.33	1.06
3567	272.83	220.07	2.08E-02	5.31E-02	0.42	1.06
3568	272.86	220.15	1.62E-02	5.31E-02	0.32	1.06
3569	272.86	220.18	2.81E-02	5.31E-02	0.56	1.06
3570	272.88	220.25	1.27E-02	5.31E-02	0.25	1.06
3571	272.89	220.29	2.15E-02	5.31E-02	0.43	1.06
3572	272.94	220.34	2.43E-02	5.31E-02	0.49	1.06
3573	272.95	220.40	2.62E-02	5.32E-02	0.52	1.06
3574	273.00	220.44	1.43E-02	5.31E-02	0.29	1.06
3575	273.02	220.48	2.20E-02	5.31E-02	0.44	1.06
3576	273.05	220.52	1.95E-02	5.32E-02	0.39	1.06
3577	273.07	220.59	2.19E-02	5.31E-02	0.44	1.06
3578	273.07	220.62	2.40E-02	5.31E-02	0.48	1.06
3579	273.09	220.68	1.39E-02	5.31E-02	0.28	1.06
3580	273.10	220.72	2.43E-02	5.31E-02	0.49	1.06
3581	273.14	220.76	1.76E-02	5.30E-02	0.35	1.06
3582	273.17	220.81	2.01E-02	5.30E-02	0.40	1.06
3583	273.18	220.86	1.92E-02	5.30E-02	0.38	1.06
3584	273.20	220.92	2.15E-02	5.30E-02	0.43	1.06
3585	273.23	220.96	1.11E-02	5.29E-02	0.22	1.06
3586	273.23	221.03	2.57E-02	5.29E-02	0.51	1.06
3587	273.27	221.07	2.05E-02	5.29E-02	0.41	1.06
3588	273.32	221.12	1.99E-02	5.30E-02	0.40	1.06
3589	273.33	221.16	1.90E-02	5.30E-02	0.38	1.06
3590	273.38	221.21	1.74E-02	5.30E-02	0.35	1.06
3591	273.41	221.25	2.98E-02	5.30E-02	0.60	1.06
3592	273.40	221.30	1.35E-02	5.30E-02	0.27	1.06
3593	273.47	221.35	1.82E-02	5.30E-02	0.36	1.06
3594	273.44	221.39	2.16E-02	5.30E-02	0.43	1.06
3595	273.46	221.44	1.80E-02	5.29E-02	0.36	1.06
3596	273.50	221.47	2.39E-02	5.29E-02	0.48	1.06
3597	273.55	221.54	1.80E-02	5.29E-02	0.36	1.06
3598	273.54	221.58	2.24E-02	5.29E-02	0.45	1.06
3599	273.61	221.63	2.55E-02	5.28E-02	0.51	1.06
3600	273.64	221.68	1.89E-02	5.29E-02	0.38	1.06
3601	273.65	221.75	1.84E-02	5.28E-02	0.37	1.06
3602	273.67	221.79	8.95E-03	5.29E-02	0.18	1.06
3603	273.72	221.84	2.51E-02	5.29E-02	0.50	1.06
3604	273.74	221.88	2.13E-02	5.29E-02	0.43	1.06
3605	273.80	221.93	1.70E-02	5.28E-02	0.34	1.06
3606	273.81	221.96	1.77E-02	5.29E-02	0.35	1.06
3607	273.84	222.06	1.27E-02	5.28E-02	0.25	1.06
3608	273.89	222.09	2.80E-02	5.28E-02	0.56	1.06
3609	273.90	222.34	2.61E-02	5.27E-02	0.52	1.05
3610	273.93	222.38	1.43E-02	5.28E-02	0.29	1.06
3611	273.97	222.44	1.88E-02	5.27E-02	0.38	1.05
3612	274.01	222.50	1.20E-02	5.27E-02	0.24	1.05

3613	274.00	222.55	2.53E-02	5.27E-02	0.51	1.05
3614	274.06	222.58	2.55E-02	5.27E-02	0.51	1.05
3615	274.11	222.62	1.60E-02	5.27E-02	0.32	1.05
3616	274.04	222.70	1.97E-02	5.27E-02	0.39	1.05
3617	274.12	222.75	1.69E-02	5.26E-02	0.34	1.05
3618	274.12	222.77	2.35E-02	5.27E-02	0.47	1.05
3619	274.15	222.83	1.40E-02	5.27E-02	0.28	1.05
3620	274.15	222.87	2.28E-02	5.26E-02	0.46	1.05
3621	274.22	222.91	2.41E-02	5.26E-02	0.48	1.05
3622	274.21	222.97	1.48E-02	5.26E-02	0.30	1.05
3623	274.25	223.04	1.97E-02	5.26E-02	0.39	1.05
3624	274.26	223.07	1.70E-02	5.25E-02	0.34	1.05
3625	274.31	223.12	2.48E-02	5.25E-02	0.50	1.05
3626	274.33	223.15	2.58E-02	5.25E-02	0.52	1.05
3627	274.34	223.22	1.94E-02	5.25E-02	0.39	1.05
3628	274.35	223.26	2.29E-02	5.24E-02	0.46	1.05
3629	274.39	223.31	2.11E-02	5.25E-02	0.42	1.05
3630	274.37	223.36	2.41E-02	5.25E-02	0.48	1.05
3631	274.47	223.43	2.40E-02	5.25E-02	0.48	1.05
3632	274.45	223.47	1.70E-02	5.25E-02	0.34	1.05
3633	274.52	223.54	2.34E-02	5.24E-02	0.47	1.05
3634	274.53	223.58	2.52E-02	5.24E-02	0.50	1.05
3635	274.57	223.64	1.54E-02	5.25E-02	0.31	1.05
3636	274.56	223.69	2.59E-02	5.24E-02	0.52	1.05
3637	274.66	223.77	2.06E-02	5.24E-02	0.41	1.05
3638	274.67	223.80	1.76E-02	5.23E-02	0.35	1.05
3639	274.73	223.86	1.57E-02	5.24E-02	0.31	1.05
3640	274.77	223.92	1.76E-02	5.23E-02	0.35	1.05
3641	274.78	223.96	1.65E-02	5.22E-02	0.33	1.04
3642	274.81	224.01	1.60E-02	5.22E-02	0.32	1.04
3643	274.86	224.05	2.20E-02	5.22E-02	0.44	1.04
3644	274.90	224.11	2.08E-02	5.22E-02	0.42	1.04
3645	274.93	224.17	2.20E-02	5.22E-02	0.44	1.04
3646	274.97	224.22	1.41E-02	5.22E-02	0.28	1.04
3647	274.99	224.28	2.22E-02	5.23E-02	0.44	1.05
3648	275.01	224.32	1.89E-02	5.22E-02	0.38	1.04
3649	275.05	224.35	2.01E-02	5.22E-02	0.40	1.04
3650	275.08	224.42	2.26E-02	5.22E-02	0.45	1.04
3651	275.13	224.47	2.71E-02	5.22E-02	0.54	1.04
3652	275.17	224.53	1.27E-02	5.22E-02	0.25	1.04
3653	275.19	224.56	2.83E-02	5.22E-02	0.57	1.04
3654	275.21	224.63	1.90E-02	5.21E-02	0.38	1.04
3655	275.25	224.68	2.14E-02	5.21E-02	0.43	1.04
3656	275.30	224.72	3.14E-02	5.22E-02	0.63	1.04
3657	275.31	224.78	1.23E-02	5.21E-02	0.25	1.04
3658	275.31	224.84	2.04E-02	5.21E-02	0.41	1.04
3659	275.35	224.88	1.12E-02	5.21E-02	0.22	1.04
3660	275.36	224.94	2.40E-02	5.21E-02	0.48	1.04
3661	275.38	225.01	2.24E-02	5.21E-02	0.45	1.04
3662	275.41	225.02	2.72E-02	5.21E-02	0.54	1.04
3663	275.47	225.08	1.76E-02	5.21E-02	0.35	1.04
3664	275.56	225.15	1.91E-02	5.20E-02	0.38	1.04
3665	275.58	225.20	9.43E-03	5.21E-02	0.19	1.04
3666	275.63	225.25	1.80E-02	5.21E-02	0.36	1.04
3667	275.67	225.29	2.22E-02	5.20E-02	0.44	1.04
3668	275.70	225.35	2.59E-02	5.20E-02	0.52	1.04
3669	275.73	225.46	1.60E-02	5.20E-02	0.32	1.04
3670	275.78	225.50	1.92E-02	5.20E-02	0.38	1.04
3671	275.85	225.52	1.77E-02	5.19E-02	0.35	1.04
3672	275.87	225.62	1.50E-02	5.20E-02	0.30	1.04

3673	275.91	225.69	2.95E-02	5.20E-02	0.59	1.04
3674	275.96	225.75	2.06E-02	5.19E-02	0.41	1.04
3675	275.98	225.79	1.83E-02	5.19E-02	0.37	1.04
3676	276.03	225.82	1.23E-02	5.18E-02	0.25	1.04
3677	276.14	225.93	1.45E-02	5.19E-02	0.29	1.04
3678	276.20	225.96	1.87E-02	5.19E-02	0.37	1.04
3679	276.27	226.04	1.93E-02	5.19E-02	0.39	1.04
3680	276.27	226.07	2.10E-02	5.19E-02	0.42	1.04
3681	276.36	226.12	2.28E-02	5.19E-02	0.46	1.04
3682	276.42	226.18	1.73E-02	5.18E-02	0.35	1.04
3683	276.43	226.24	1.41E-02	5.18E-02	0.28	1.04
3684	276.47	226.31	1.42E-02	5.17E-02	0.28	1.03
3685	276.53	226.37	2.09E-02	5.17E-02	0.42	1.03
3686	276.50	226.40	2.03E-02	5.18E-02	0.41	1.04
3687	276.57	226.46	2.29E-02	5.17E-02	0.46	1.03
3688	276.61	226.52	2.32E-02	5.17E-02	0.46	1.03
3689	276.63	226.58	1.56E-02	5.18E-02	0.31	1.04
3690	276.63	226.64	2.76E-02	5.18E-02	0.55	1.04
3691	276.69	226.69	2.14E-02	5.17E-02	0.43	1.03
3692	276.70	226.78	2.23E-02	5.17E-02	0.45	1.03
3693	276.77	226.79	1.70E-02	5.17E-02	0.34	1.03
3694	276.82	226.85	2.06E-02	5.16E-02	0.41	1.03
3695	276.83	226.90	1.14E-02	5.17E-02	0.23	1.03
3696	276.86	226.96	1.82E-02	5.17E-02	0.36	1.03
3697	276.90	227.00	1.56E-02	5.16E-02	0.31	1.03
3698	276.93	227.06	1.68E-02	5.16E-02	0.34	1.03
3699	276.94	227.13	1.91E-02	5.15E-02	0.38	1.03
3700	276.97	227.17	1.08E-02	5.16E-02	0.22	1.03
3701	277.02	227.24	2.34E-02	5.15E-02	0.47	1.03
3702	277.03	227.28	2.39E-02	5.15E-02	0.48	1.03
3703	277.09	227.34	2.20E-02	5.15E-02	0.44	1.03
3704	277.14	227.38	2.64E-02	5.16E-02	0.53	1.03
3705	277.16	227.46	1.39E-02	5.15E-02	0.28	1.03
3706	277.16	227.50	2.31E-02	5.16E-02	0.46	1.03
3707	277.24	227.55	3.09E-02	5.16E-02	0.62	1.03
3708	277.30	227.60	2.14E-02	5.16E-02	0.43	1.03
3709	277.37	227.66	1.94E-02	5.16E-02	0.39	1.03
3710	277.37	227.72	2.74E-02	5.15E-02	0.55	1.03
3711	277.41	227.76	2.32E-02	5.15E-02	0.46	1.03
3712	277.45	227.82	1.65E-02	5.14E-02	0.33	1.03
3713	277.50	227.89	2.03E-02	5.15E-02	0.41	1.03
3714	277.56	227.92	1.90E-02	5.14E-02	0.38	1.03
3715	277.60	227.96	1.99E-02	5.14E-02	0.40	1.03
3716	277.66	228.02	2.03E-02	5.14E-02	0.41	1.03
3717	277.68	228.09	2.88E-02	5.14E-02	0.58	1.03
3718	277.73	228.13	1.92E-02	5.13E-02	0.38	1.03
3719	277.78	228.19	1.61E-02	5.13E-02	0.32	1.03
3720	277.77	228.23	1.90E-02	5.14E-02	0.38	1.03
3721	277.84	228.27	1.54E-02	5.13E-02	0.31	1.03
3722	277.91	228.33	2.42E-02	5.13E-02	0.48	1.03
3723	277.96	228.39	2.69E-02	5.13E-02	0.54	1.03
3724	278.02	228.43	2.08E-02	5.13E-02	0.42	1.03
3725	278.04	228.48	2.05E-02	5.13E-02	0.41	1.03
3726	278.09	228.56	2.69E-02	5.12E-02	0.54	1.02
3727	278.12	228.62	1.40E-02	5.12E-02	0.28	1.02
3728	278.20	228.66	2.98E-02	5.12E-02	0.60	1.02
3729	278.25	228.72	1.74E-02	5.12E-02	0.35	1.02
3730	278.29	228.79	1.18E-02	5.12E-02	0.24	1.02
3731	278.34	228.83	2.02E-02	5.12E-02	0.40	1.02
3732	278.38	228.89	2.82E-02	5.12E-02	0.56	1.02

3733	278.41	228.94	1.83E-02	5.12E-02	0.37	1.02
3734	278.47	228.98	1.98E-02	5.11E-02	0.40	1.02
3735	278.53	229.02	1.59E-02	5.11E-02	0.32	1.02
3736	278.57	229.09	2.81E-02	5.12E-02	0.56	1.02
3737	278.61	229.14	2.16E-02	5.11E-02	0.43	1.02
3738	278.63	229.18	1.90E-02	5.12E-02	0.38	1.02
3739	278.70	229.21	2.13E-02	5.11E-02	0.43	1.02
3740	278.73	229.25	2.33E-02	5.11E-02	0.47	1.02
3741	278.78	229.29	2.15E-02	5.10E-02	0.43	1.02
3742	278.79	229.35	2.29E-02	5.10E-02	0.46	1.02
3743	278.84	229.39	1.81E-02	5.09E-02	0.36	1.02
3744	278.90	229.45	2.23E-02	5.09E-02	0.45	1.02
3745	278.89	229.51	1.77E-02	5.09E-02	0.35	1.02
3746	278.91	229.57	1.85E-02	5.10E-02	0.37	1.02
3747	278.93	229.61	1.73E-02	5.09E-02	0.35	1.02
3748	278.97	229.66	1.78E-02	5.10E-02	0.36	1.02
3749	279.00	229.71	2.17E-02	5.09E-02	0.43	1.02
3750	279.05	229.76	1.91E-02	5.09E-02	0.38	1.02
3751	279.11	229.77	2.41E-02	5.09E-02	0.48	1.02
3752	279.15	229.71	8.51E-03	5.09E-02	0.17	1.02
3753	279.17	229.71	2.83E-02	5.10E-02	0.57	1.02
3754	279.22	229.77	1.94E-02	5.09E-02	0.39	1.02
3755	279.26	229.83	2.53E-02	5.09E-02	0.51	1.02
3756	279.28	229.95	8.29E-03	5.09E-02	0.17	1.02
3757	279.35	230.04	2.45E-02	5.08E-02	0.49	1.02
3758	279.36	230.10	1.24E-02	5.07E-02	0.25	1.01
3759	279.42	230.09	1.71E-02	5.08E-02	0.34	1.02
3760	279.47	230.17	2.39E-02	5.08E-02	0.48	1.02
3761	279.54	230.21	3.19E-02	5.07E-02	0.64	1.01
3762	279.59	230.24	1.95E-02	5.08E-02	0.39	1.02
3763	279.61	230.28	1.47E-02	5.07E-02	0.29	1.01
3764	279.68	230.43	1.96E-02	5.08E-02	0.39	1.02
3765	279.70	230.41	2.25E-02	5.08E-02	0.45	1.02
3766	279.76	230.46	1.87E-02	5.08E-02	0.37	1.02
3767	279.80	230.56	2.20E-02	5.08E-02	0.44	1.02
3768	279.83	230.55	2.55E-02	5.08E-02	0.51	1.02
3769	279.82	230.57	1.94E-02	5.07E-02	0.39	1.01
3770	279.84	230.61	2.60E-02	5.07E-02	0.52	1.01
3771	279.88	230.64	2.27E-02	5.07E-02	0.45	1.01
3772	279.92	230.72	1.71E-02	5.07E-02	0.34	1.01
3773	279.96	230.76	2.45E-02	5.06E-02	0.49	1.01
3774	280.01	230.80	2.32E-02	5.06E-02	0.46	1.01
3775	280.05	230.87	1.90E-02	5.05E-02	0.38	1.01
3776	280.07	230.98	1.75E-02	5.06E-02	0.35	1.01
3777	280.13	231.06	2.19E-02	5.05E-02	0.44	1.01
3778	280.20	231.07	2.20E-02	5.06E-02	0.44	1.01
3779	280.22	231.08	2.35E-02	5.06E-02	0.47	1.01
3780	280.28	231.14	1.20E-02	5.06E-02	0.24	1.01
3781	280.29	231.21	2.02E-02	5.06E-02	0.40	1.01
3782	280.33	231.28	2.20E-02	5.06E-02	0.44	1.01
3783	280.32	231.30	2.67E-02	5.06E-02	0.53	1.01
3784	280.36	231.35	2.57E-02	5.05E-02	0.51	1.01
3785	280.29	231.37	2.06E-02	5.05E-02	0.41	1.01
3786	280.40	231.39	1.81E-02	5.05E-02	0.36	1.01
3787	280.44	231.43	2.79E-02	5.05E-02	0.56	1.01
3788	280.50	231.51	2.14E-02	5.05E-02	0.43	1.01
3789	280.57	231.63	2.14E-02	5.04E-02	0.43	1.01

서 지 정 보 양 식

수행기관보고서번호	위탁기관 보고서번호	표준 보고서번호	INIS주제 코드
KAERI/TR-3305/2007			

제목/부제	소규모 캡슐에서의 소듐-이산화탄소 반응 실험

연구책임자 및 부서명	김병호(소듐기술개발)
연구자 및 부서명	최종현, 석수동, 김종만, 최병해, 김병호, 한도희

발 행 지	대 전	발행기관	한국원자력연구소	발 행 일	2006. 07.
페 이 지	67 페이지	도표	유(0), 무( )	크 기	26 Cm
참고사항					

비밀여부	공개(0),대외비( ),_ _급비밀	보고서종류	기술보고서
연구위탁기관		계약번호	

초록(300단어 내외)

모듈러 소듐-초임계 이산화탄소 열교환기의 이용은 총괄 플랜트 에너지 이용에 있어서 주목할 만한 개선을 이루게 된다. 그러나 이러한 유형의 원자로에서 1차 및 2차 계통 사이에 있는 열교환기의 경계층에서 튜브가 파손되었을 시 발생할 지도 모르는 $Na-CO_2$ 반응의 영향으로 소듐 pool에 있는 고압 CO_2의 blowdown 및 intermixing 현상이 발생할 수 있으며 이로 인한 압력 증가로 열교환기의 구조에 심각한 영향을 미칠 수가 있다. 이용 가능한 데이터에 의하면 소듐과 이산화탄소의 화학반응에 의해 소듐 산화물, 탄산나트륨, 탄소 및 일산화탄소 등이 생성된다고 기록되어 있으나 이러한 거동에 대한 실험과 연구정보는 거의 없는 실정이다. 따라서 압력 영향에 대한 예비평가를 위하여 $Na-CO_2$ 반응에 대한 실험이 소규모 캡슐에서의 온도, 가스 압력 및 유량에 따른 반응성을 연구하기 위해 수행되었다.

이 보고서에는 소듐-이산화탄소 반응 실험을 위한 배경, 실험절차 및 실험결과에 대해 기술되어 있다.

주제명 키워드(10단어 내외)

소듐, 이산화탄소, 일산화탄소, 탄산나트륨, 가스분석기, 압력센서, 가스질량유량계, 캡슐, 소듐저장탱크, 가스분리기

BIBLIOGRAPHIC INFORMATION SHEET

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Title/Subtitle	A Small-Scale Capsule Test for Investigating the Sodium-Carbon Dioxide Reaction
Project Manager and Dept.	B.H. Kim (Sodium Technology)
Researcher and Dept.	J.H. Choi, S.D. Suk, J.M. Kim, B.H. Choi, B.H. Kim, D.H. Hahn

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Abstract(About 300 words)

The utilization of modular sodium-to-supercritical CO_2 heat exchangers may yield significant improvements for an overall plant energy utilization. The consequences of a failure of the sodium CO_2 heat exchanger boundary, however, would involve the blowdown and intermixing of high-pressure CO_2 in a sodium pool, causing a pressurization which may threaten the structural integrity of the heat exchanger. Available data seems to indicate that the chemical reaction between sodium and CO_2 would likely produce sodium oxides, sodium carbonate, carbon and carbon monoxide. Information on the kinetics of the sodium-CO_2 reaction is virtually non-existent. A small-scale capsule test has been conducted to explore the basic nature and extent of the sodium-CO_2 chemical reaction, for a preliminary assessment of the pressurization issue.

In this report, the background, experimental procedure and results for the sodium-carbon dioxide reaction experiments was described. The experiments were performed to investigate the sodium-carbon dioxide reaction on the temperature, pressure and gas flow in a small capsule.

Subject Keywords (About 10 words))

sodium, carbon dioxide, carbon monoxide, sodium carbonate, gas chromatography, pressure sensor, gas mass flow meter, capsule, sodium storage tank, vapor trap