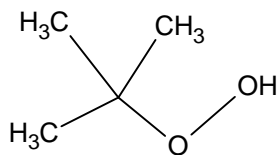


tert-butyl hydroperoxide

$C_4H_{10}O_2$

TBHP

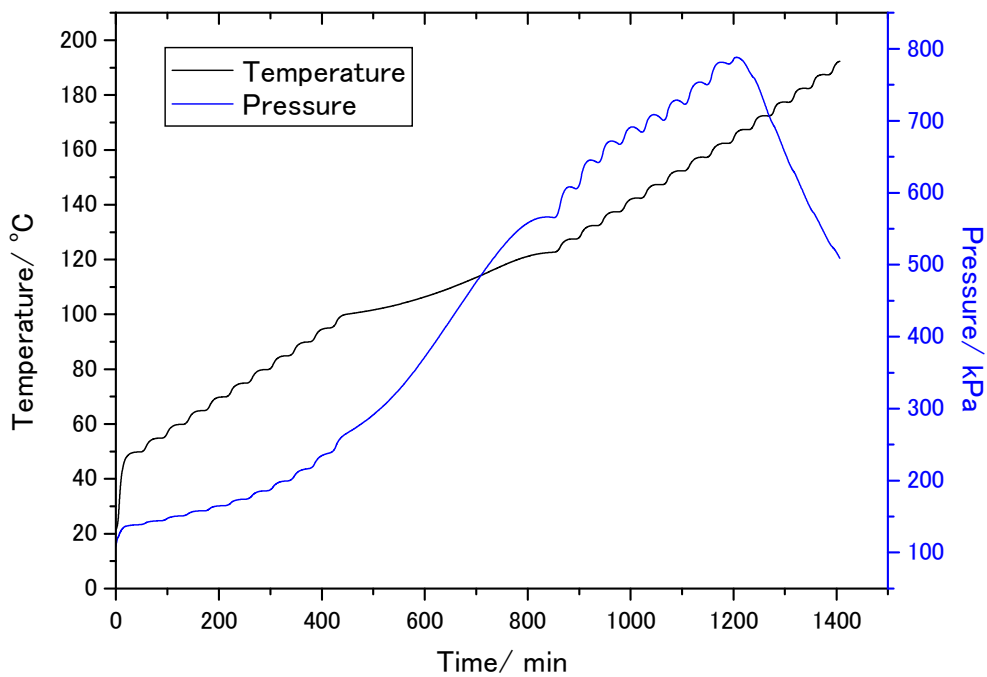


ARC device: New ARC (TIAX, LLC)

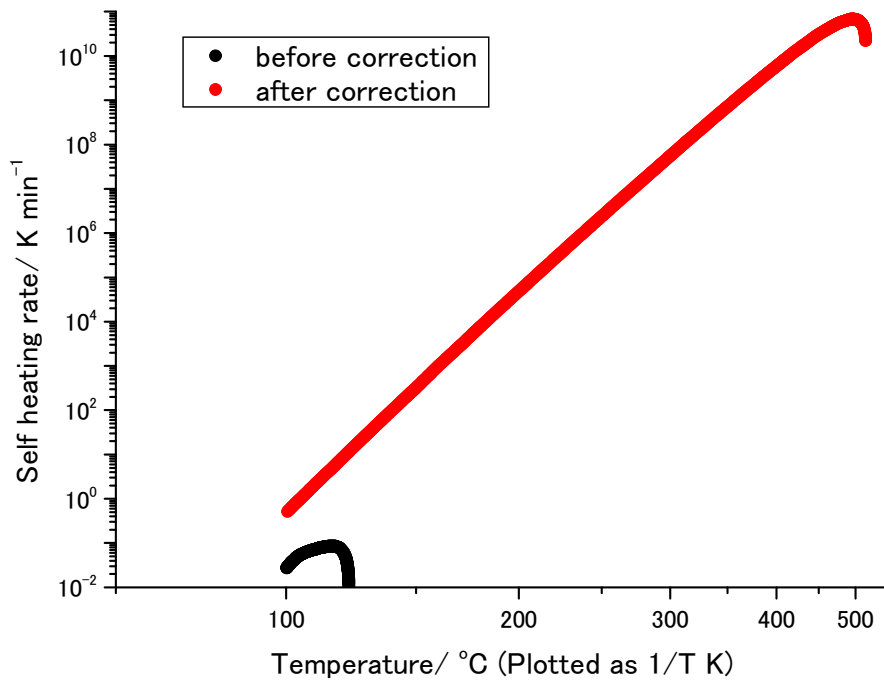
Date: 2009/12

Operator: Y. S.

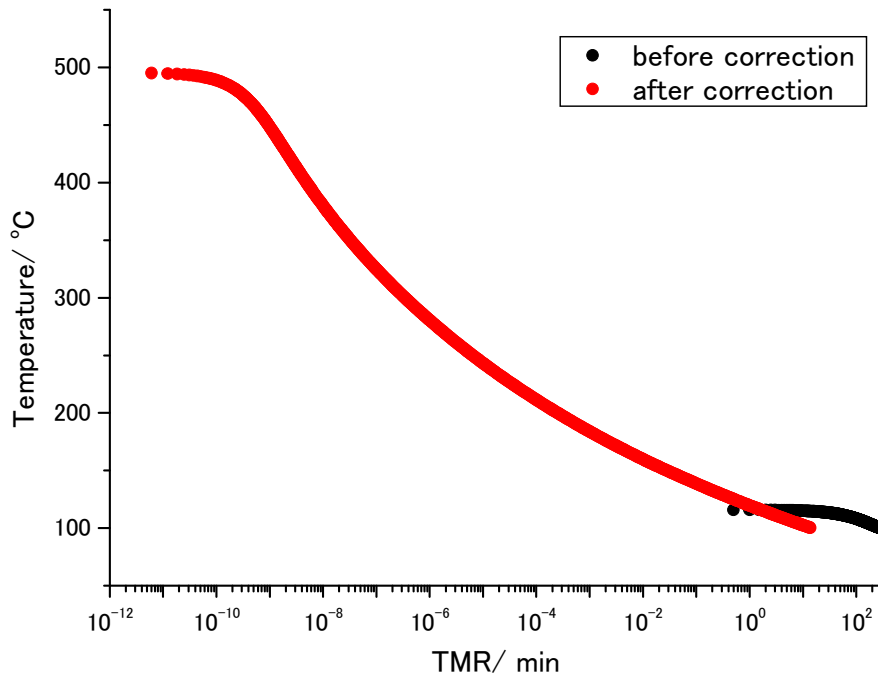
a) Weight: 0.233 g



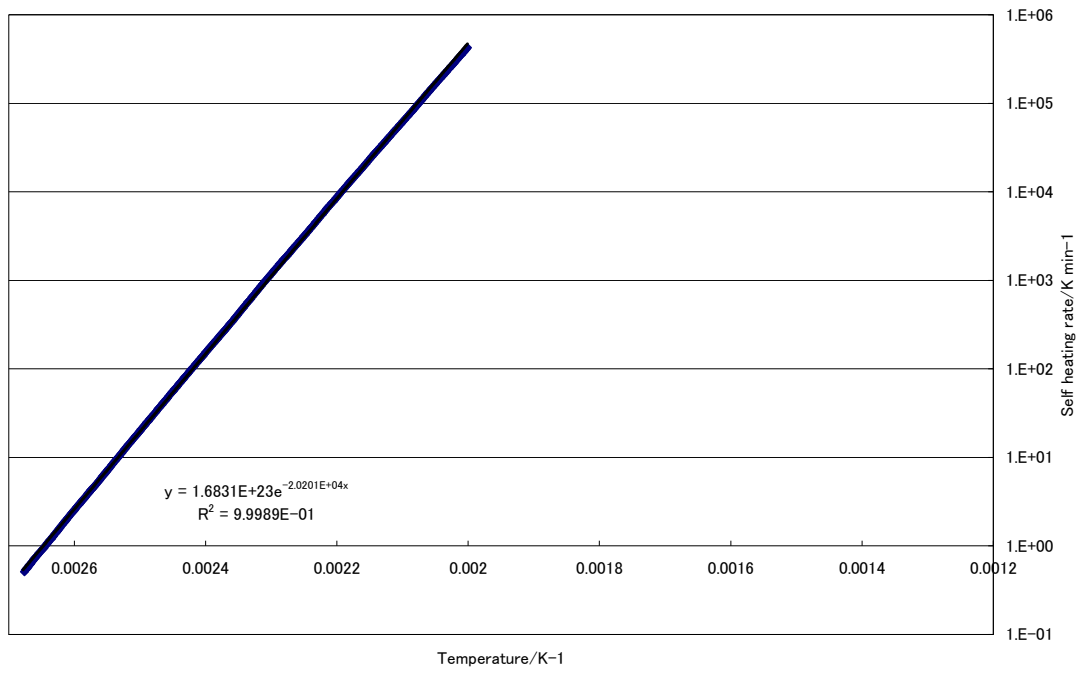
Time vs. Temperature and Pressure



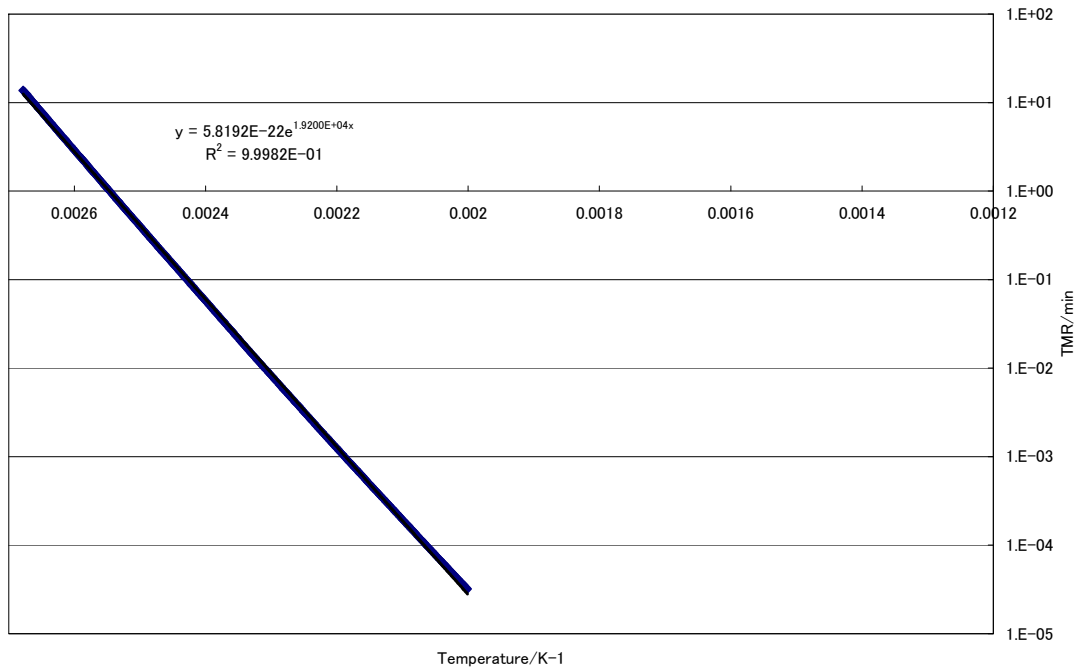
Temperature vs. Self heating rate



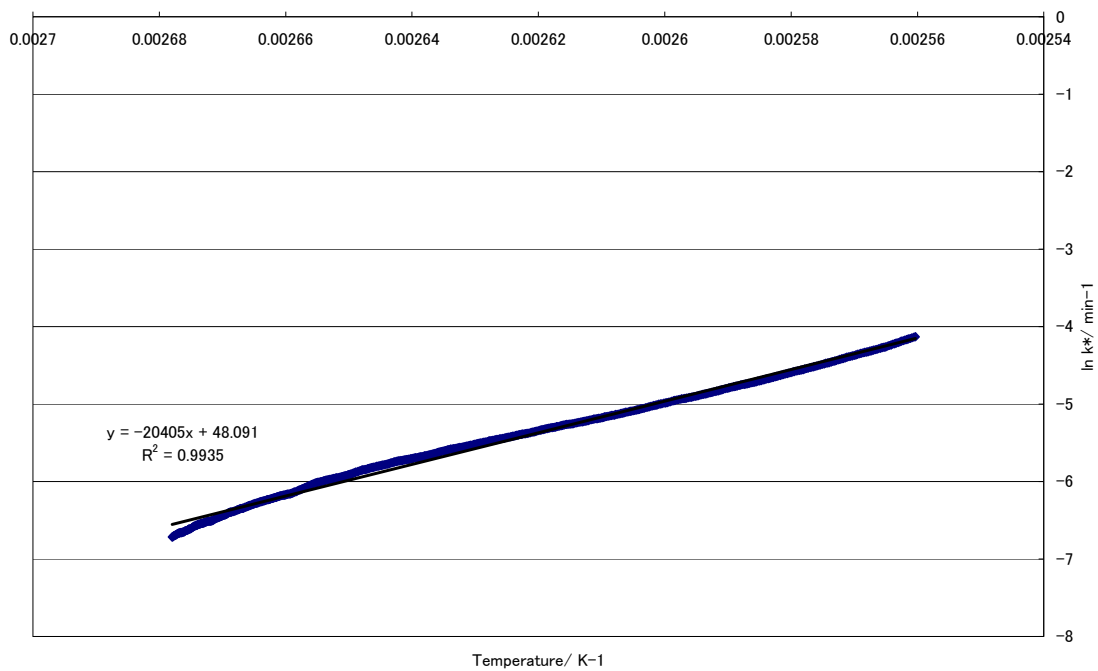
TMR vs. Temperature



Temperature vs. Self heating rate (approximate calculation)

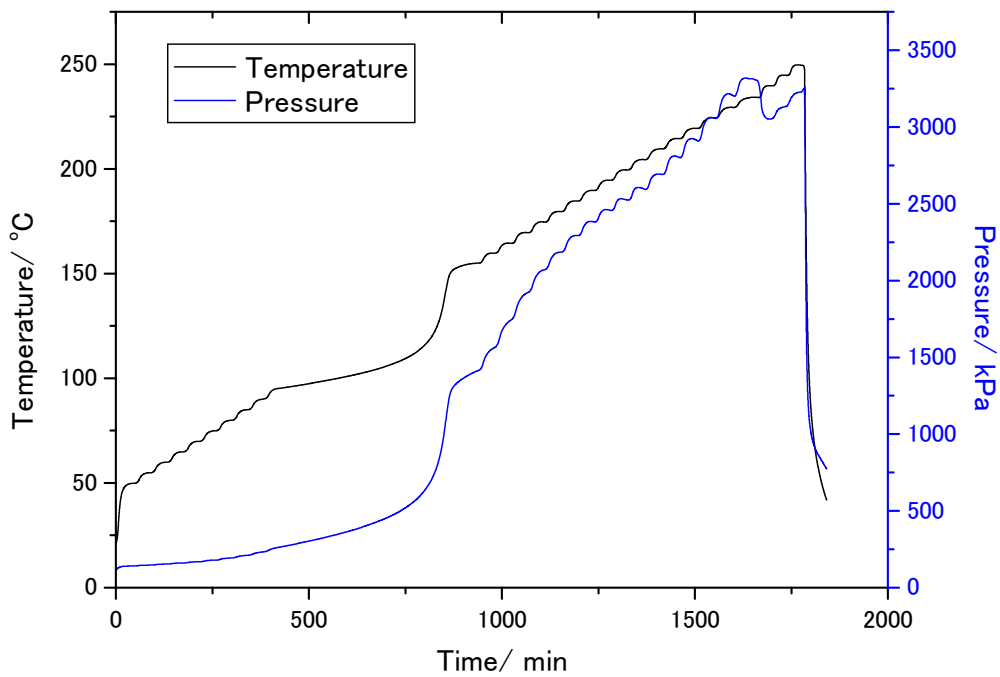


Temperature vs. TMR (approximate calculation)

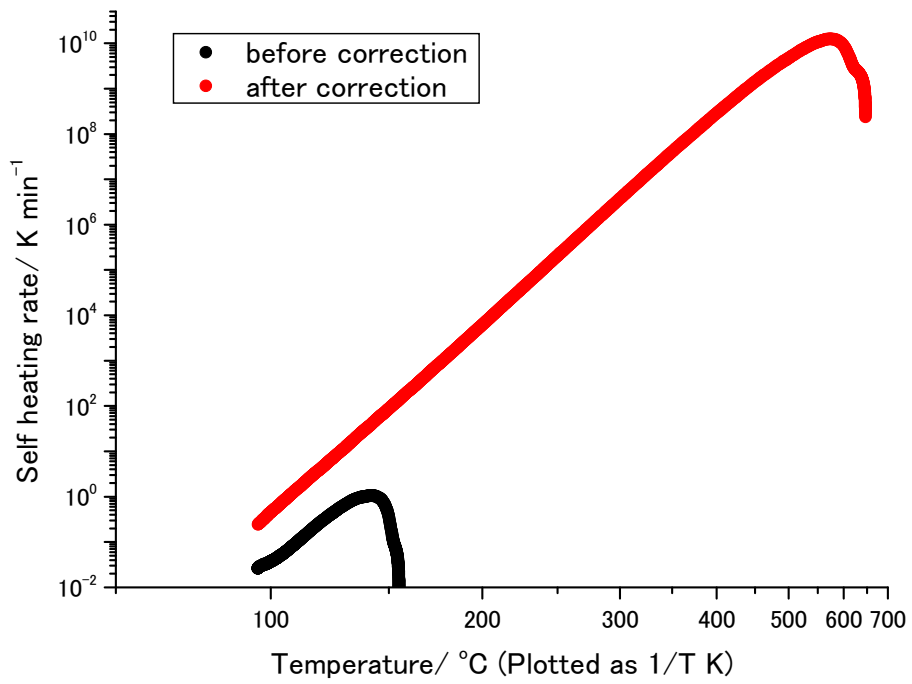


Arrhenius equation (approximate calculation)

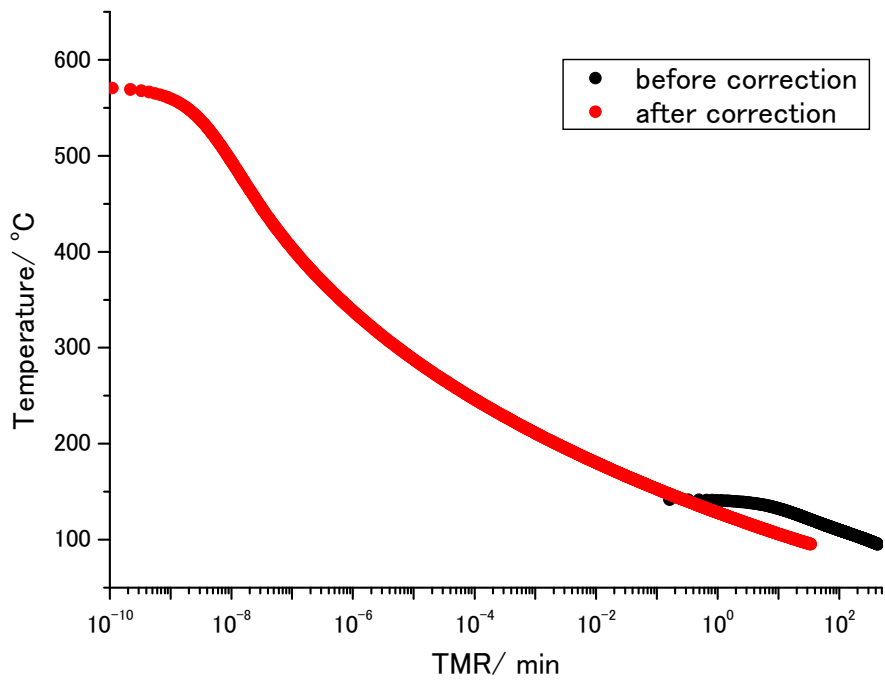
b) Weight: 0.495 g



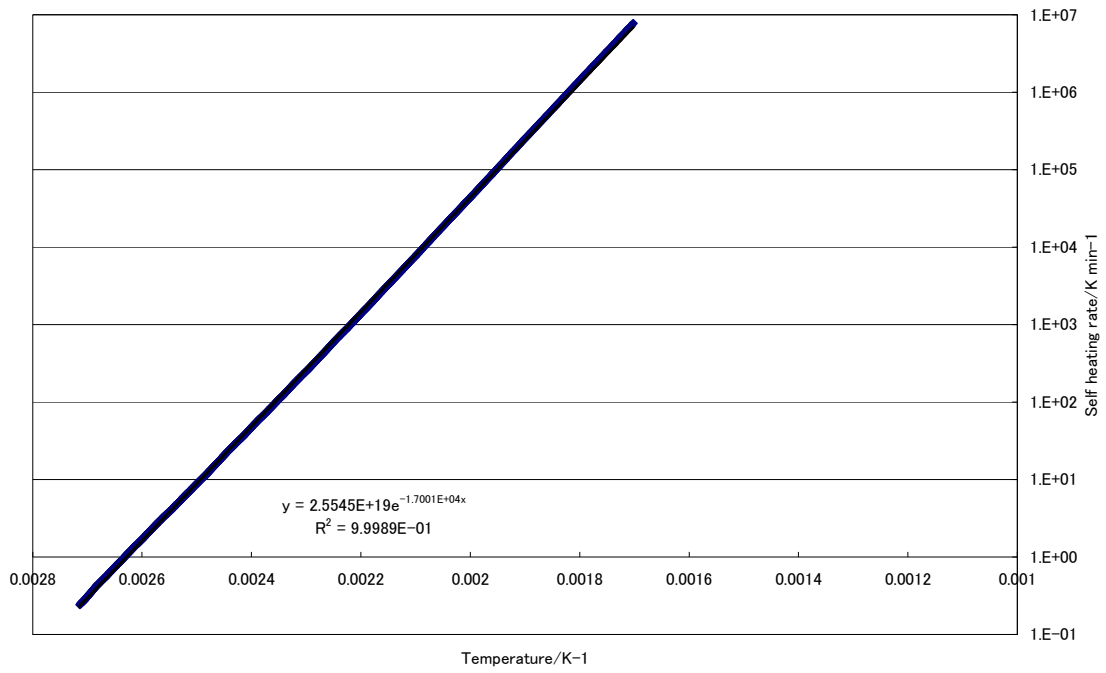
Time vs. Temperature and Pressure



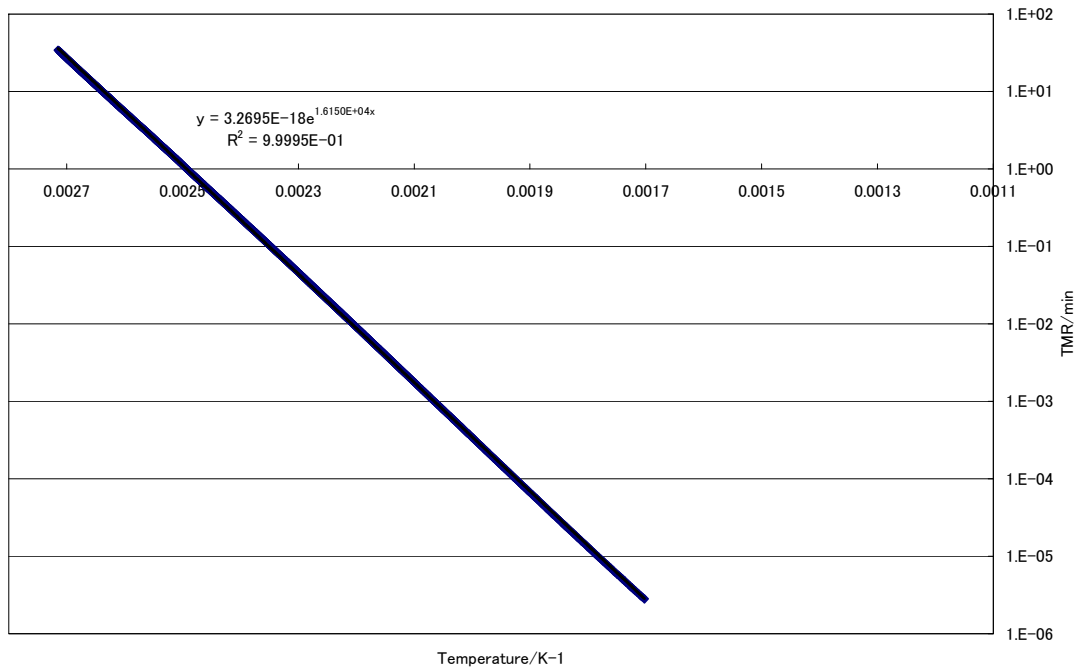
Temperature vs. Self heating rate



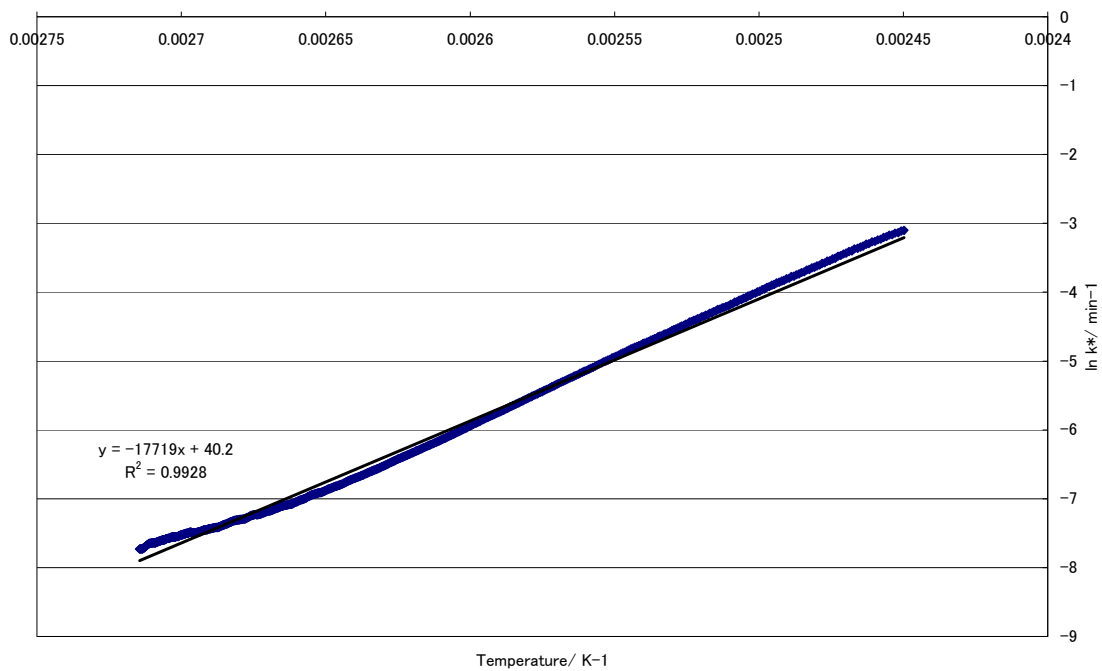
TMR vs. Temperature



Temperature vs. Self heating rate (approximate calculation)

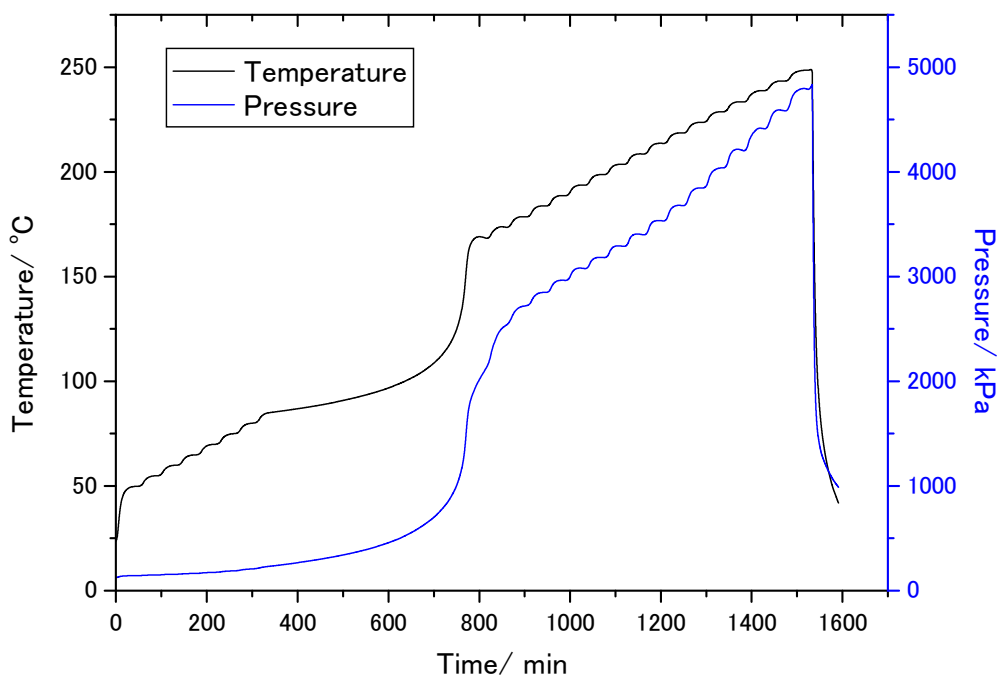


Temperature vs. TMR (approximate calculation)

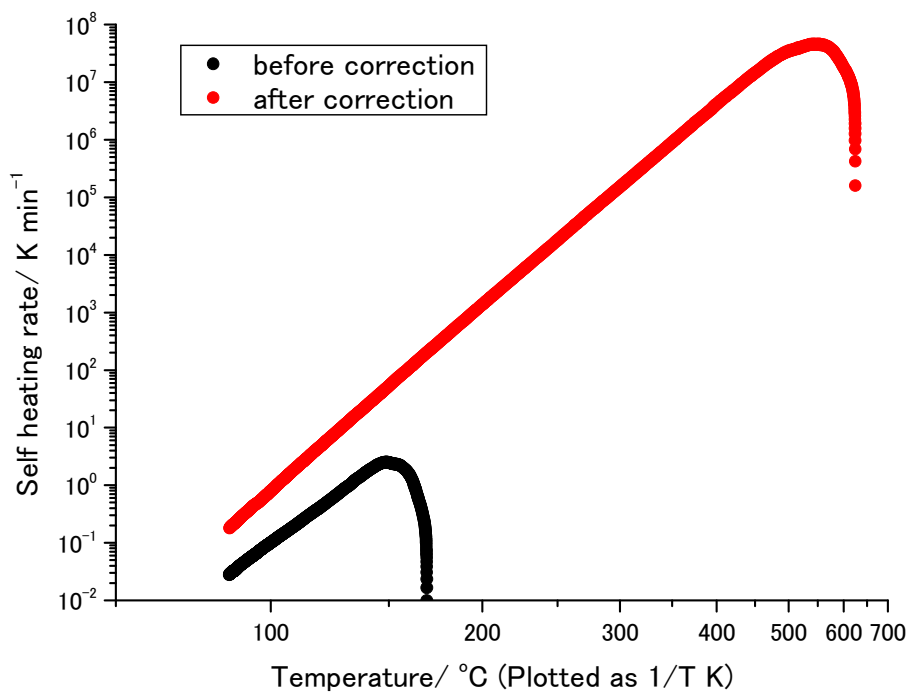


Arrhenius equation (approximate calculation)

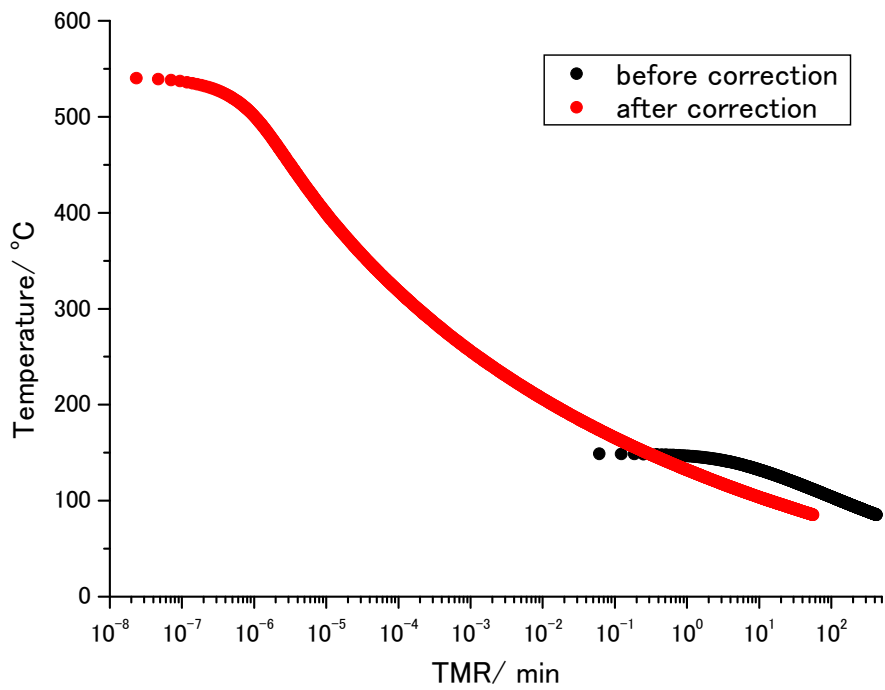
c) Weight: 0.750 g



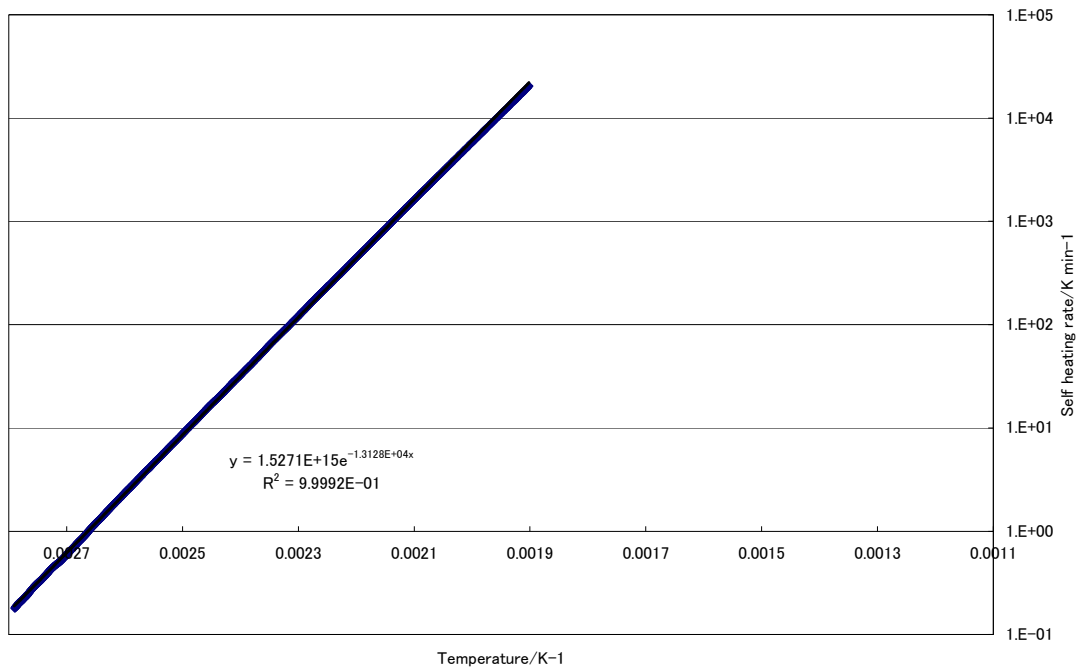
Time vs. Temperature and Pressure



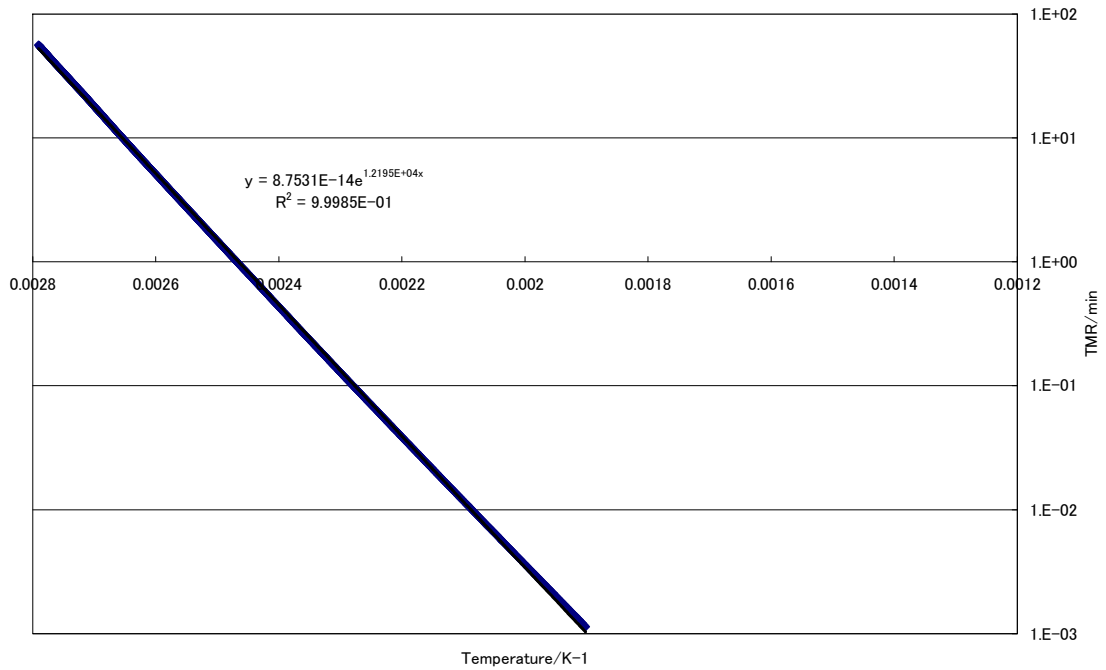
Temperature vs. Self heating rate



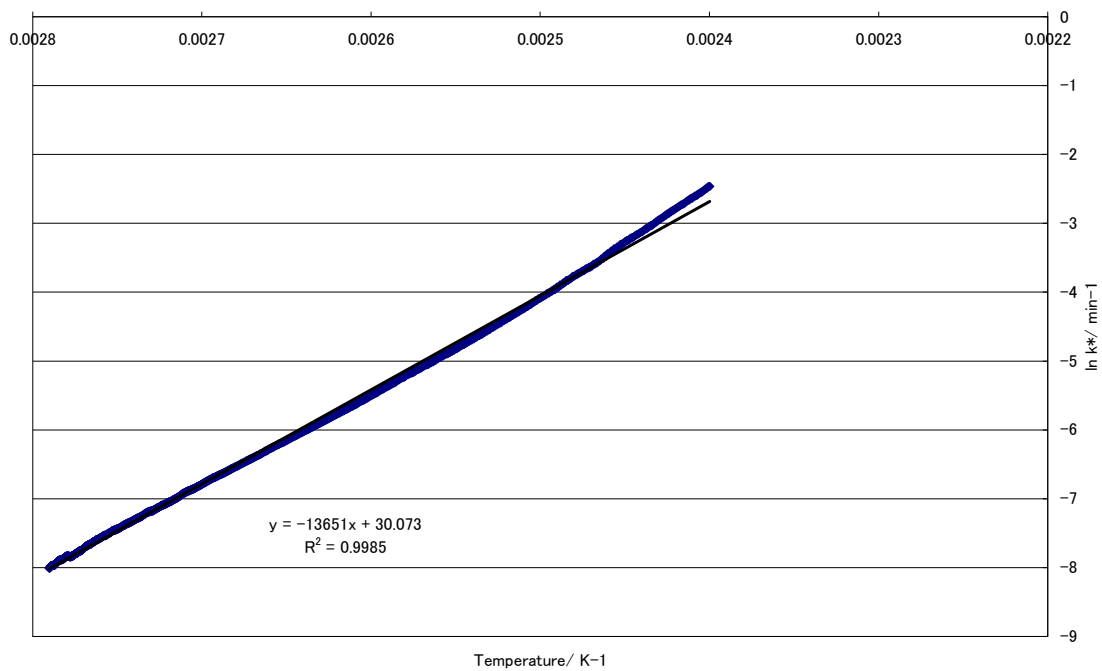
TMR vs. Temperature



Temperature vs. Self heating rate (approximate calculation)

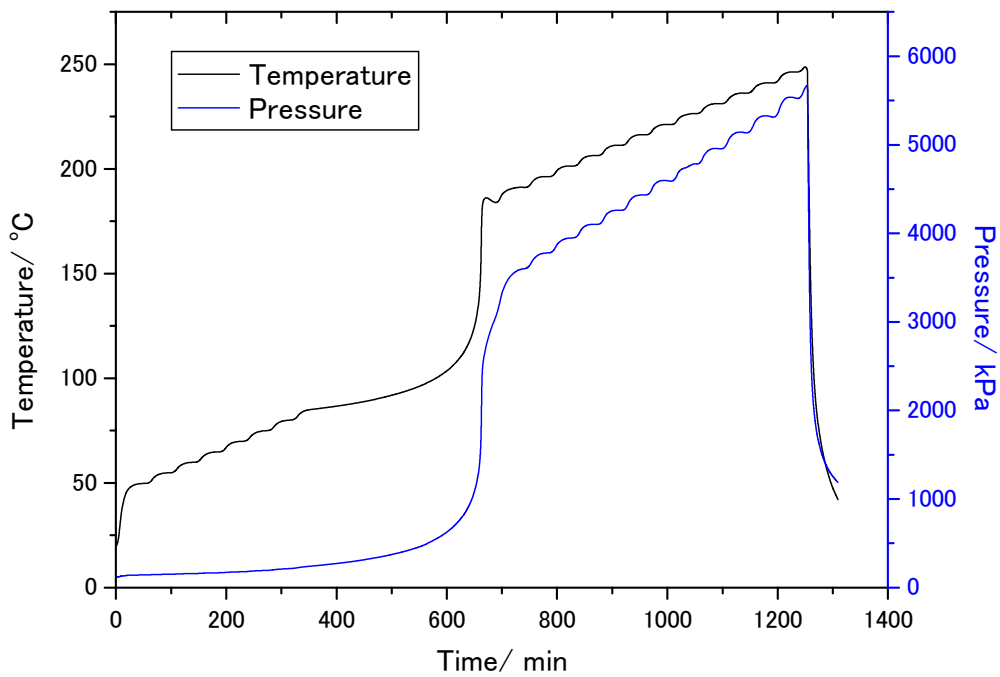


Temperature vs. TMR (approximate calculation)

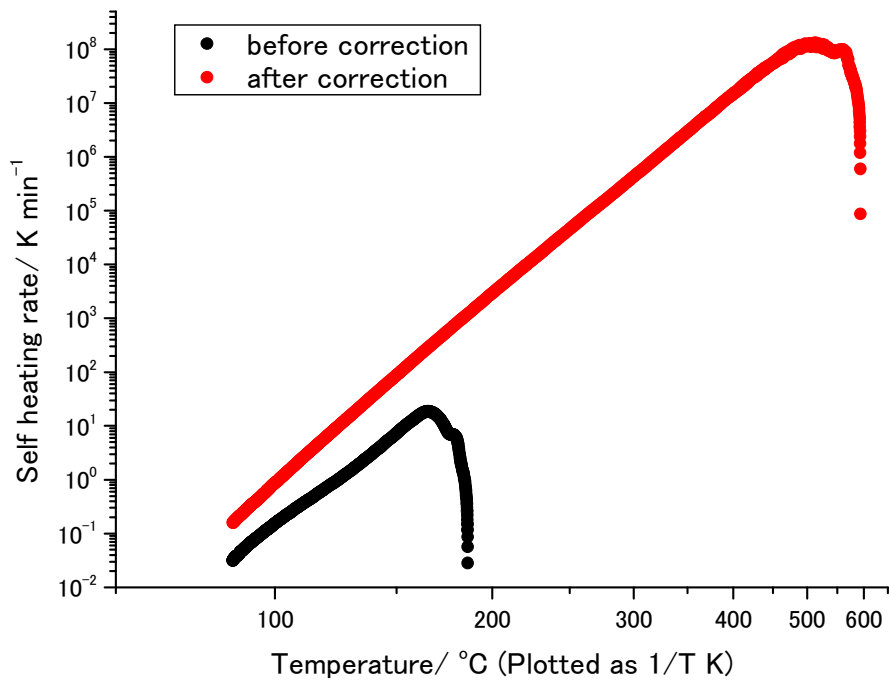


Arrhenius equation (approximate calculation)

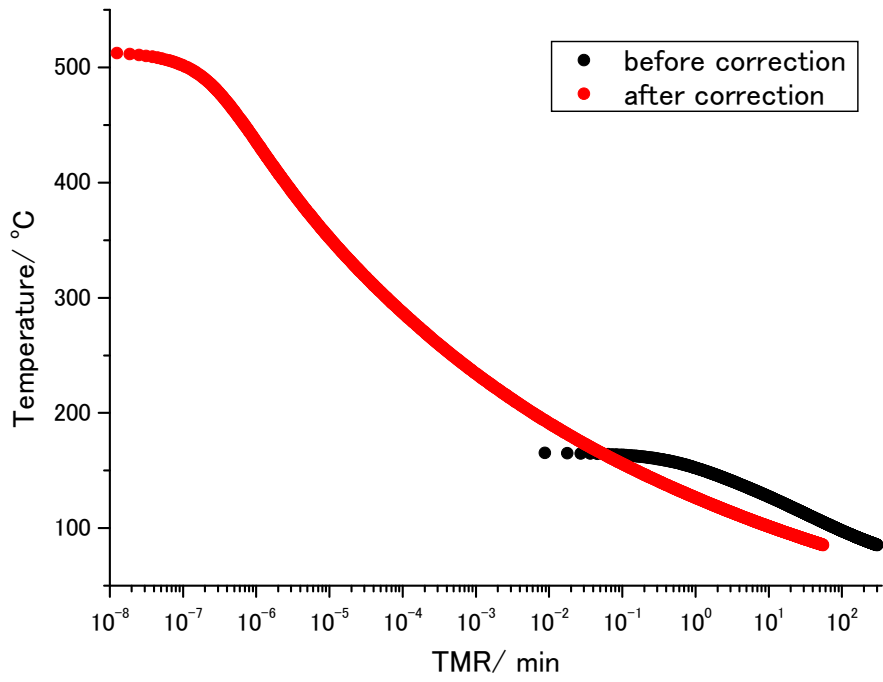
d) Weight: 1.017 g



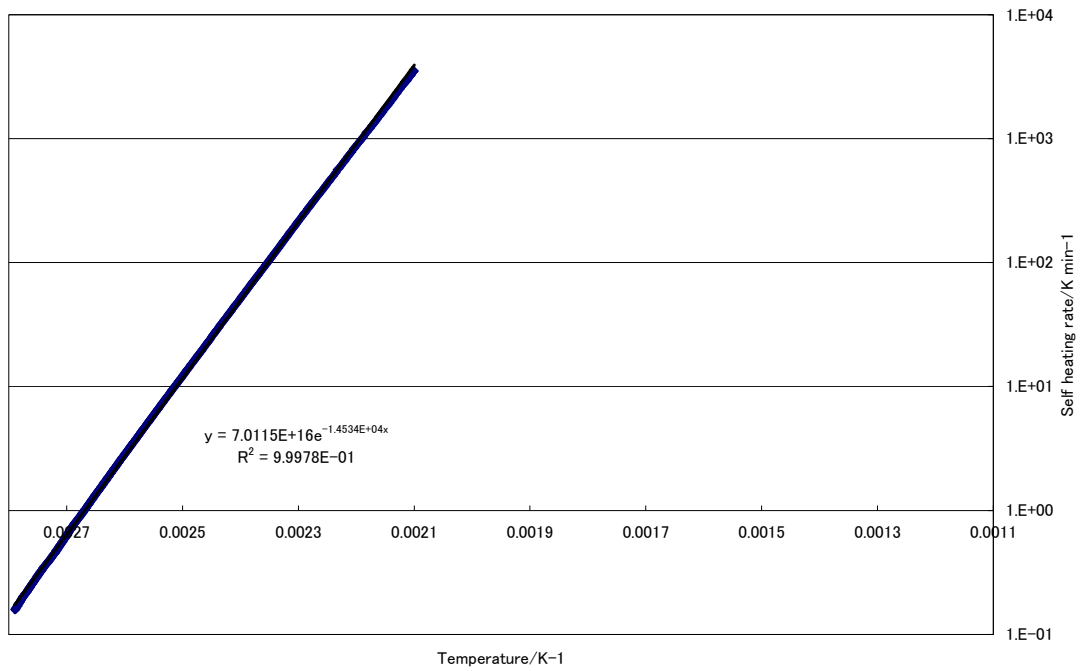
Time vs. Temperature and Pressure



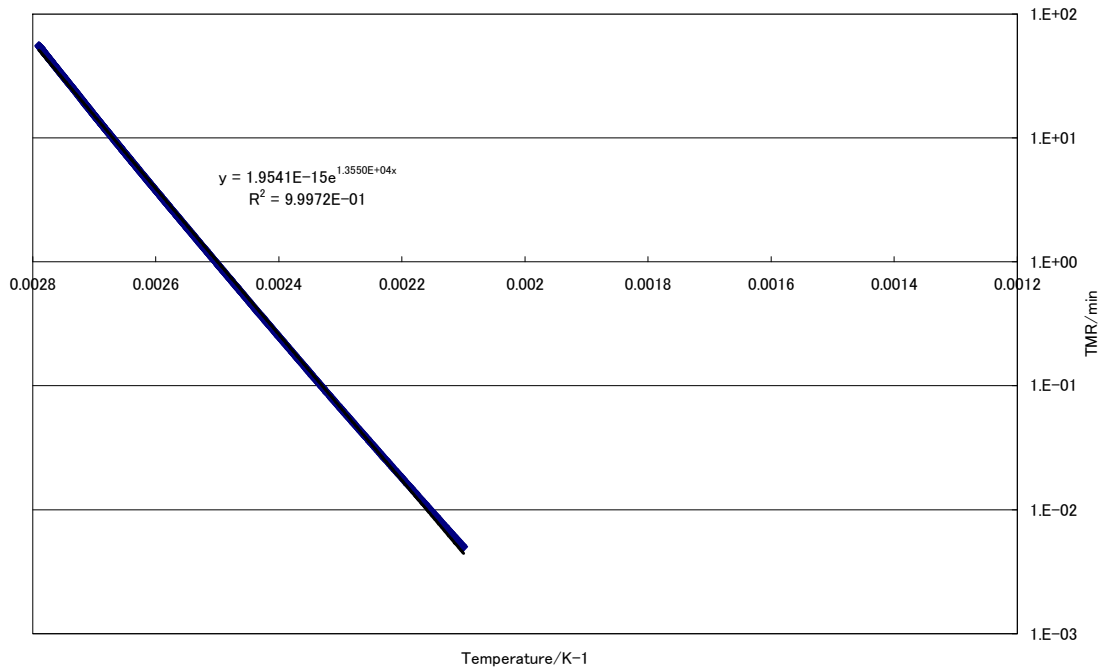
Temperature vs. Self heating rate



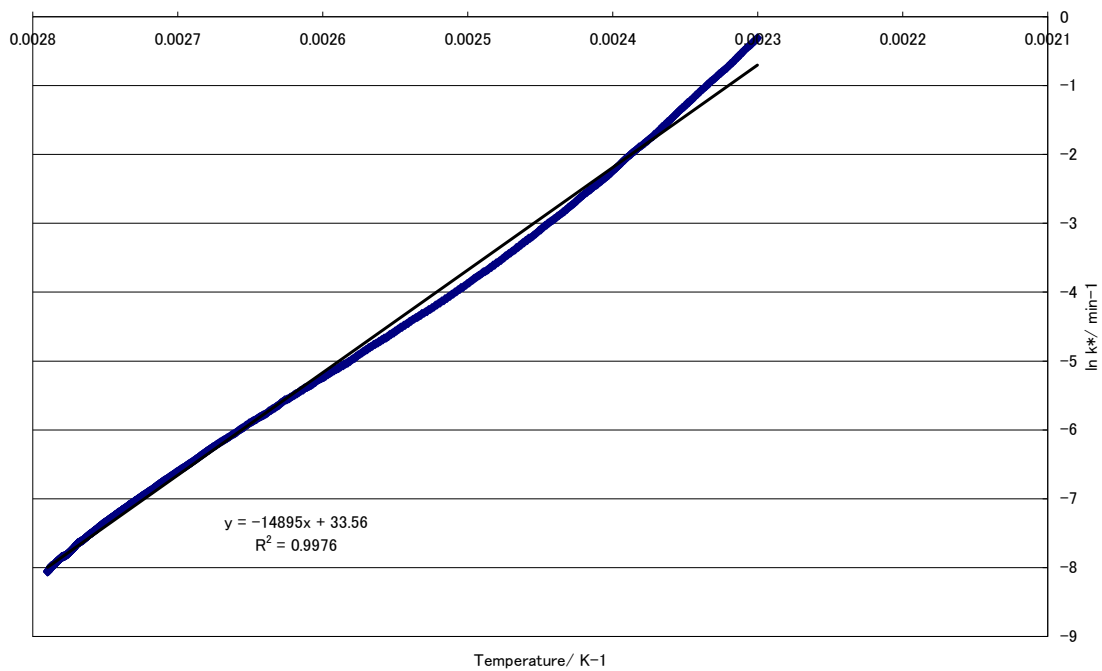
TMR vs. Temperature



Temperature vs. Self heating rate (approximate calculation)

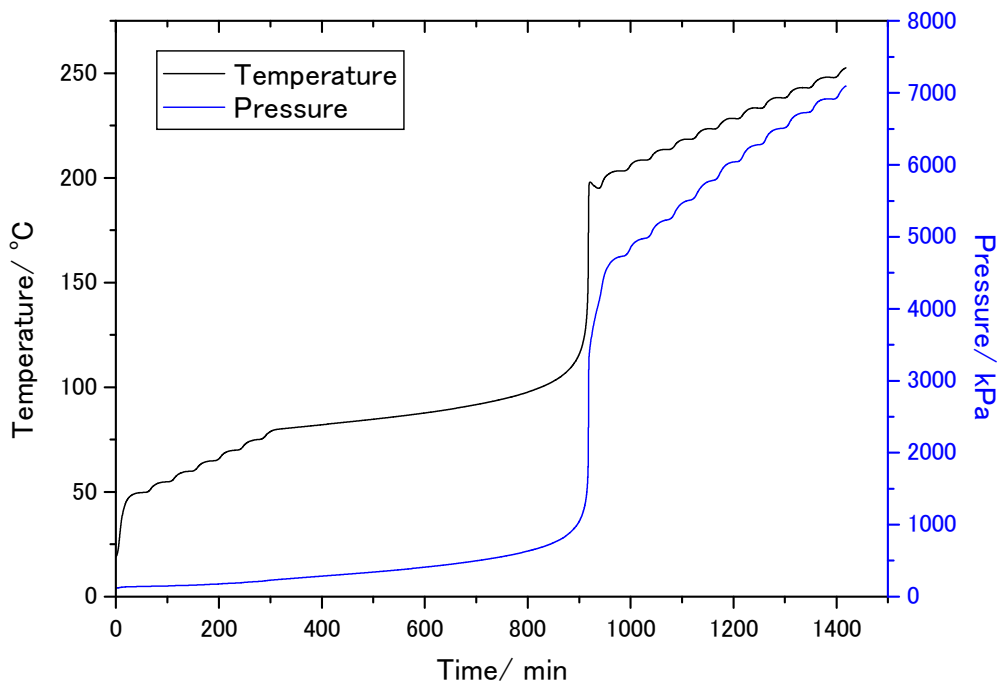


Temperature vs. TMR (approximate calculation)

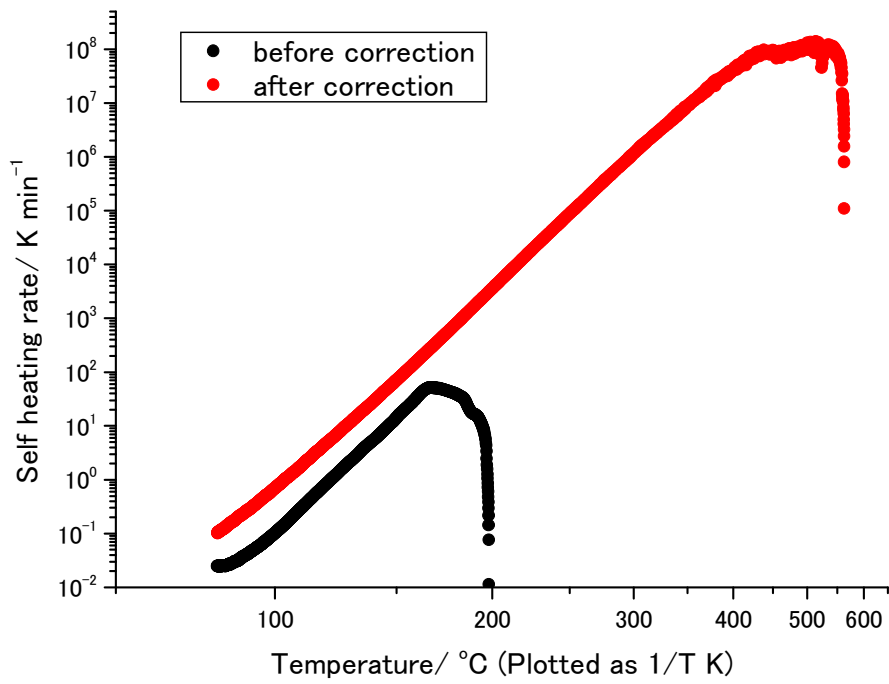


Arrhenius equation (approximate calculation)

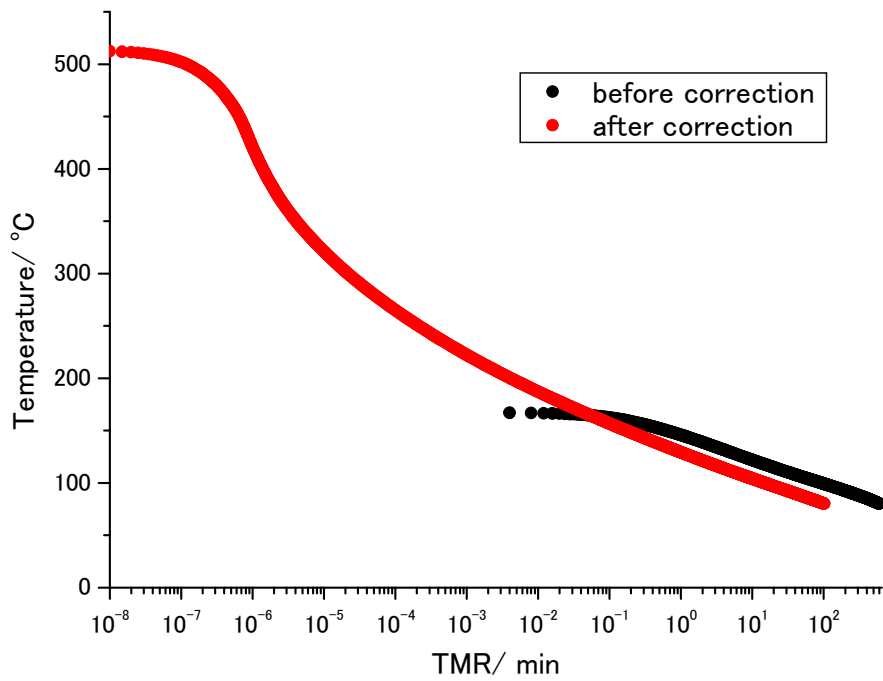
e) Weight: 1.314 g



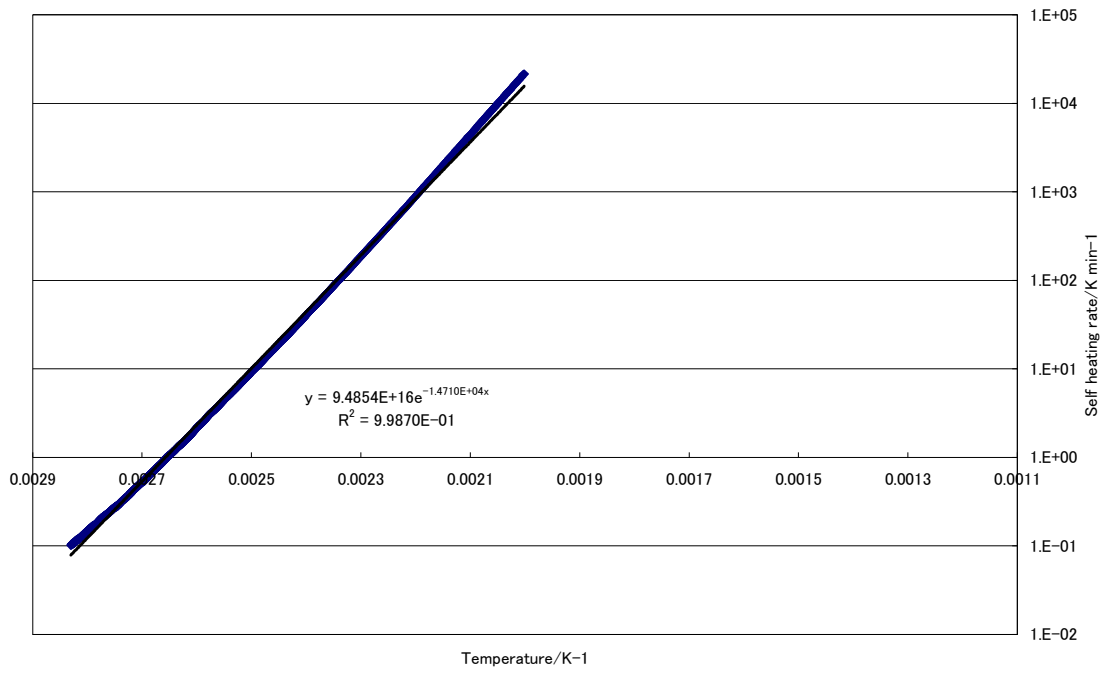
Time vs. Temperature and Pressure



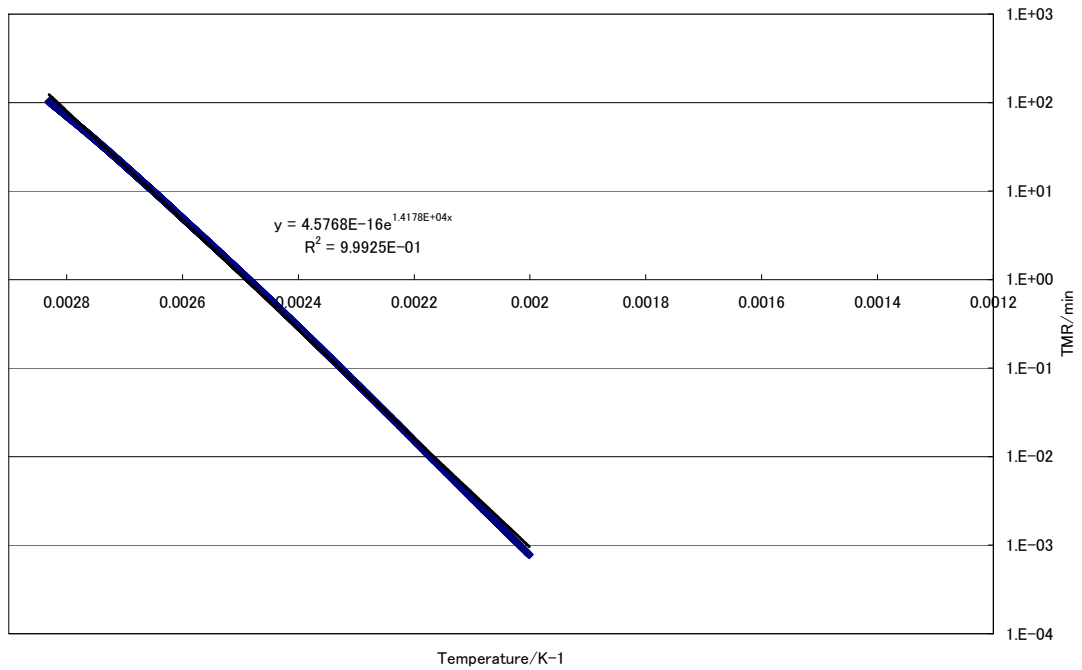
Temperature vs. Self heating rate



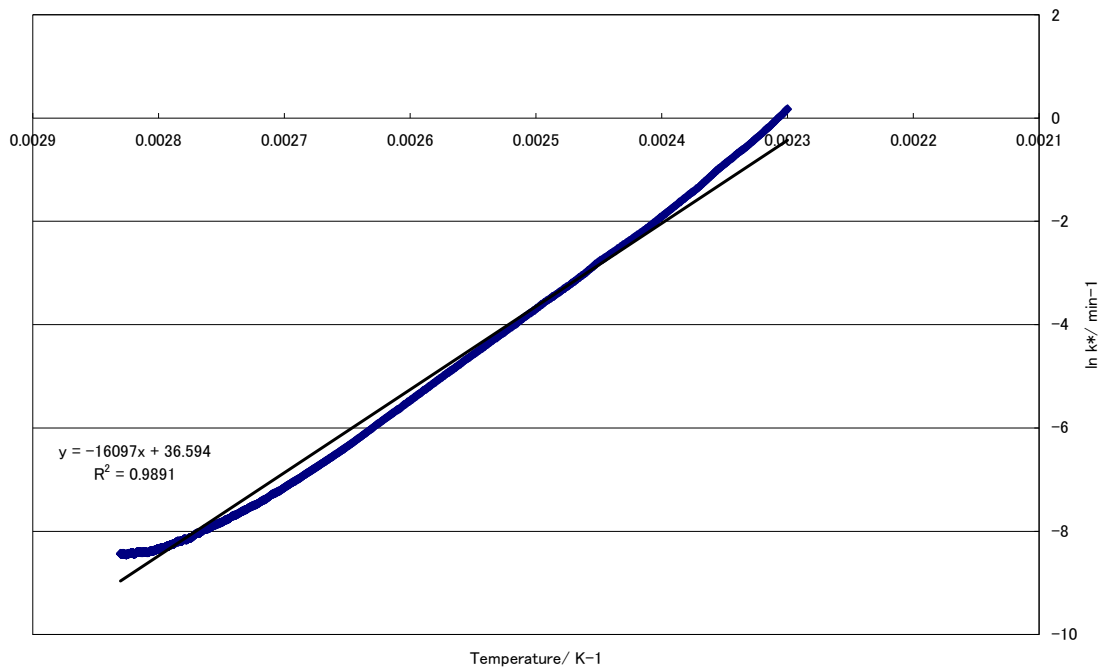
TMR vs. Temperature



Temperature vs. Self heating rate (approximate calculation)



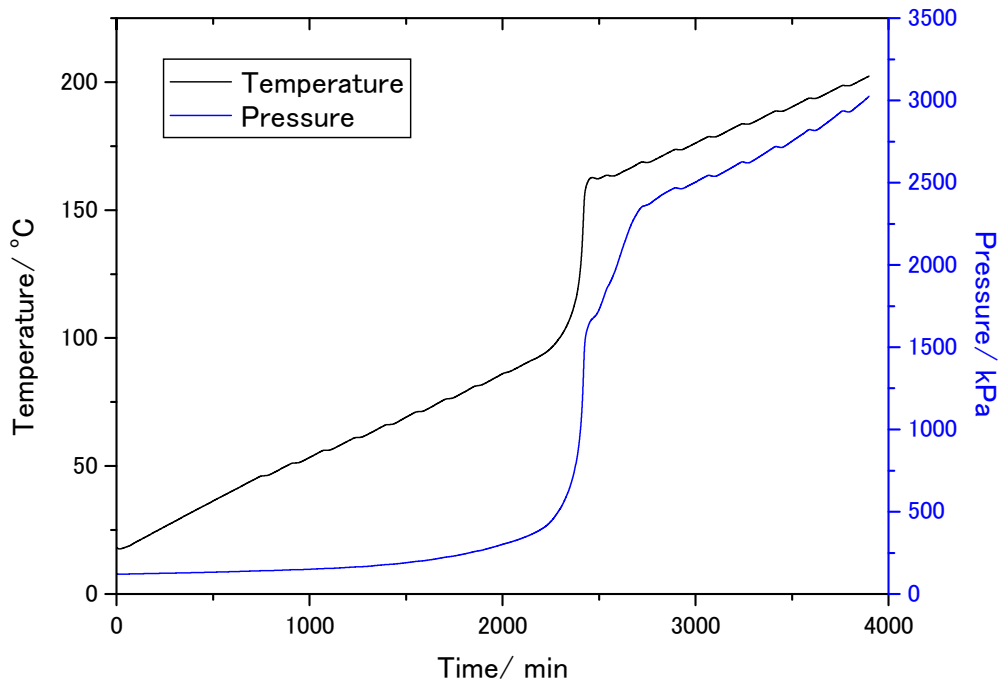
Temperature vs. TMR (approximate calculation)



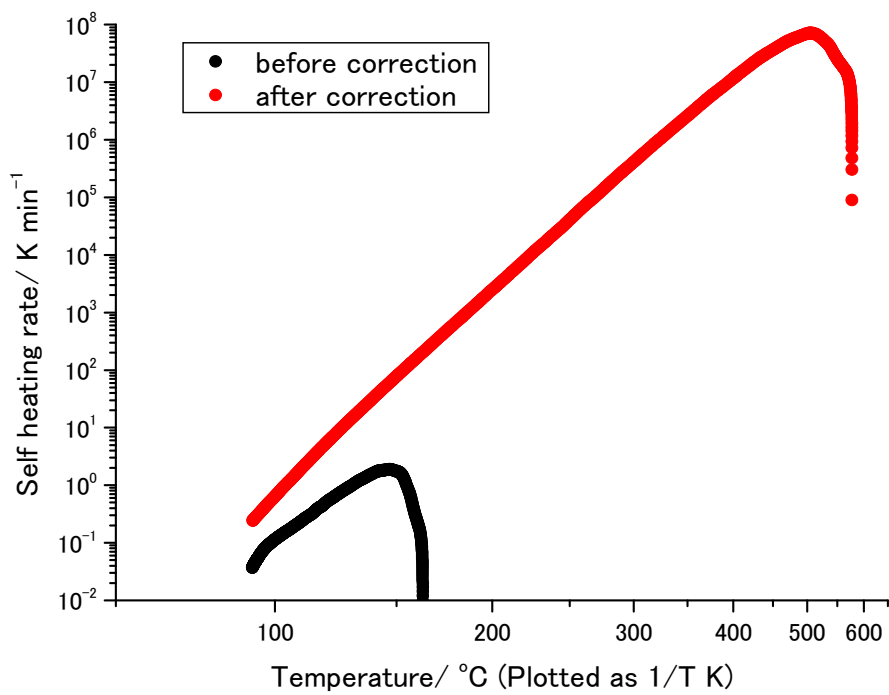
Arrhenius equation (approximate calculation)

f) Weight: 0.733 g

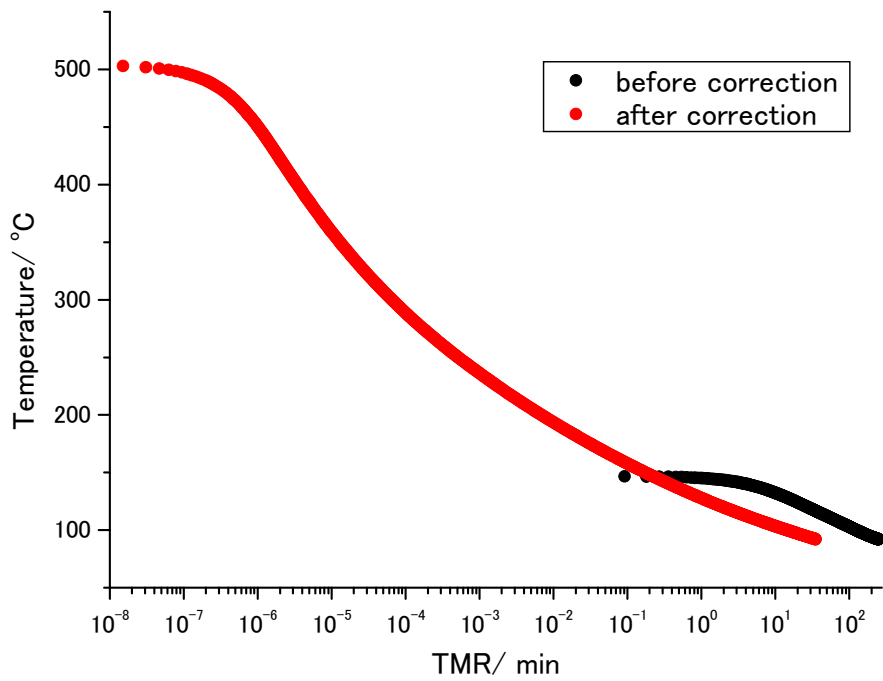
Heating rate: 0.04 K/min



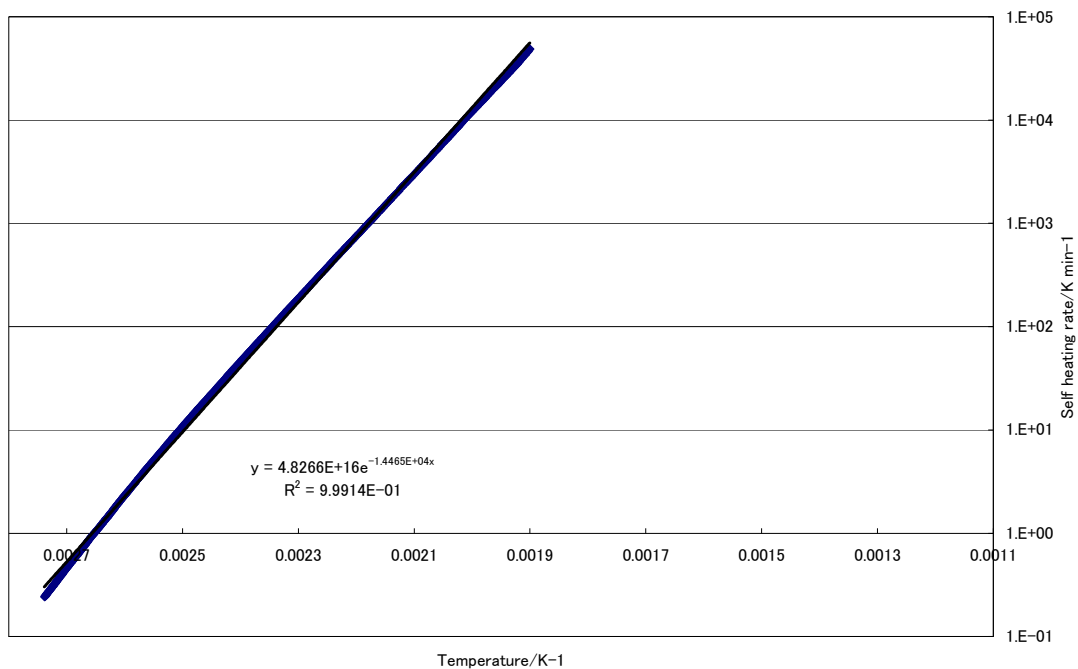
Time vs. Temperature and Pressure



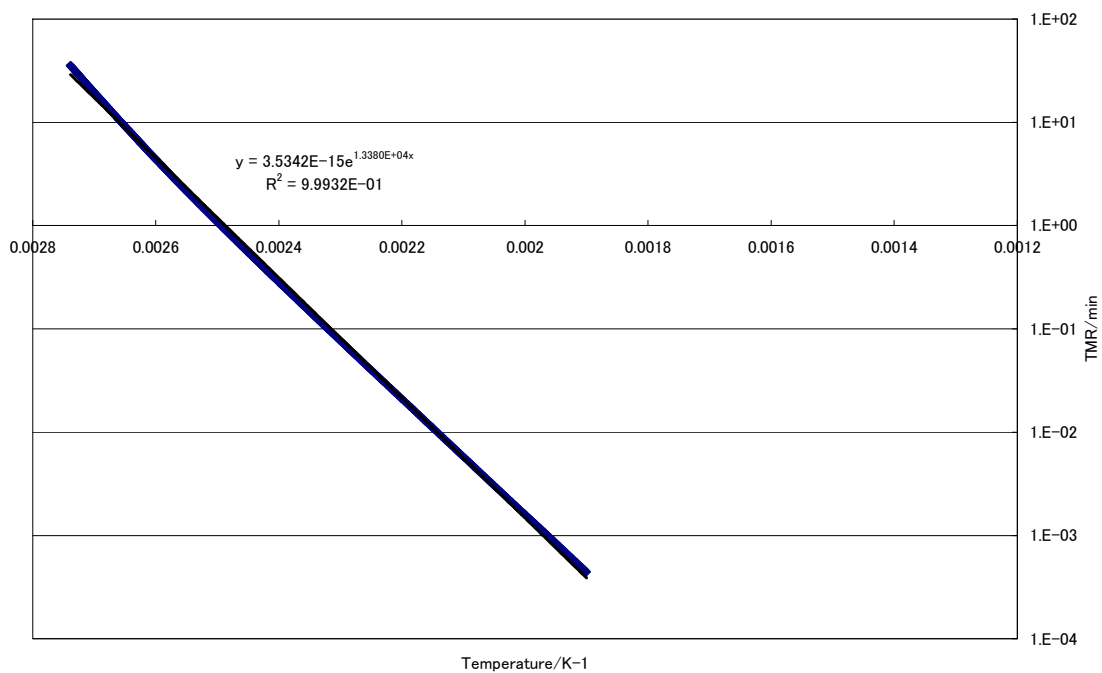
Temperature vs. Self heating rate



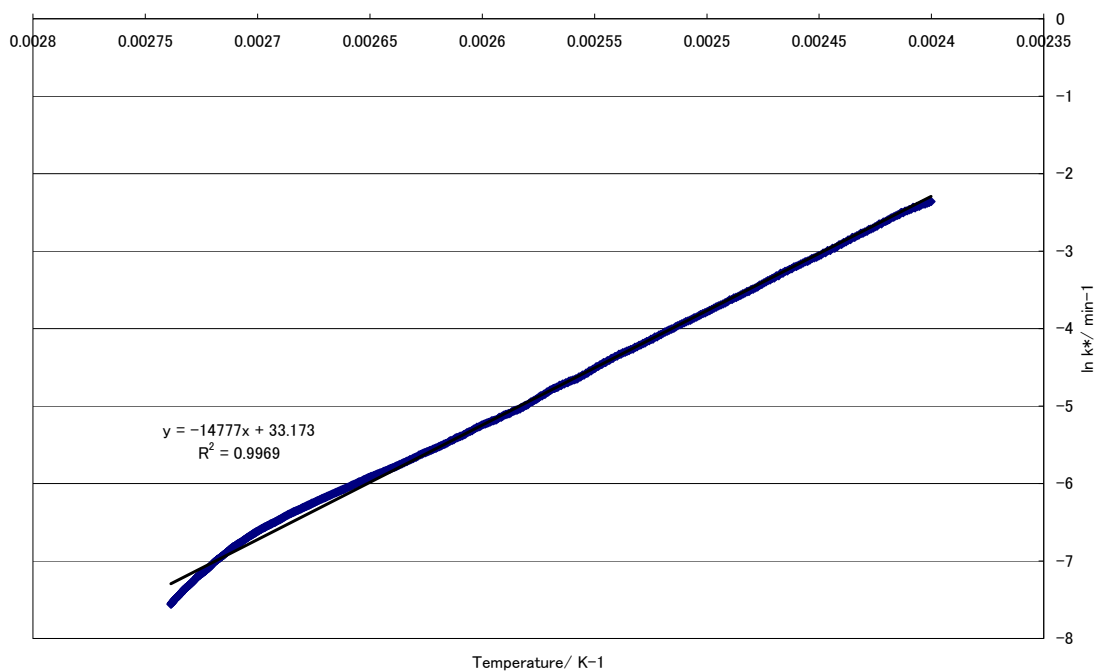
TMR vs. Temperature



Temperature vs. Self heating rate (approximate calculation)



Temperature vs. TMR (approximate calculation)



Arrhenius equation (approximate calculation)

a) Weight: 0.233 g

	Date	2009/12/17
Measuring conditions	ARC device	NewARC (TIAX, LLC)
	Operating Institute	AIST
	Operator	Y. S.
	Material of Bomb	Hastelloy C
	Weight of Bomb (g)	20.4096
	Volume of Bomb (mL)	about 9
	Weight of sample (g)	0.2327
	Weight of residue (g)	—
	Specific heat of Bomb (J K ⁻¹ g ⁻¹)	0.419
	Specific heat of sample (J K ⁻¹ g ⁻¹)	2.093
	φ facotr	18.56
	Start temperature (°C)	50
	End temperature (°C)	192
	Temperature increment (K)	5
	Waiting time (min)	15
	Searching time (min)	15
Exothermic threshold (K min ⁻¹)	0.02	

	Logging time (°C)	0.5 min
	Pressure limit (kPa)	20000
	Atmosphere	Air, atmospheric pressure
Results	T _o , Exothermic temperature (°C)	100.27
	Self heating rate at T _o (K min ⁻¹)	0.027
	Pressure at T _o (kPa)	269.13
	Temperature at maximum self heating rate (°C)	115.78
	Maximum self heating rate (K min ⁻¹)	0.085
	Pressure at maximum self heating rate (kPa)	503.38
	Pressure rising rate at maximum self heating rate (kPa min ⁻¹)	0.9551
	Maximum pressure (kPa)	566.28
	Maximum pressure rising rate (kPa min ⁻¹)	1.0784
	Temperature at maximum pressure rising rate (°C)	108.88
	Time to maximum rate (min)	271.44
	Maximum temperature (°C)	122.66
	Adiabatic temperature rise (°C)	22.39
	Activation energy (kJ mol ⁻¹)	169.6
Heat of decomposition (J g ⁻¹)	869.8	
Corrected results	T _{ARC} , Exothermic temperature (°C)	78.83
	Time of maximum rate at T _{ARC} (min)	285.26
	Self heating rate at T _{ARC} (K min ⁻¹)	0.02
	Maximum self heating rate (K min ⁻¹)	6.7425×10^{10}
	Maximum temperature (°C)	515.35
	Adiabatic temperature rise (°C)	436.52
	Heat of decomposition (J g ⁻¹)	913.6

b) Weight: 0.495 g

	Date	2009/12/11
Measuring conditions	ARC device	NewARC (TIAX, LLC)
	Operating Institute	AIST
	Operator	Y. S.

	Material of Bomb	Hastelloy C
	Weight of Bomb (g)	20.4096
	Volume of Bomb (mL)	about 9
	Weight of sample (g)	0.4948
	Weight of residue (g)	—
	Specific heat of Bomb ($\text{J K}^{-1} \text{g}^{-1}$)	0.419
	Specific heat of sample ($\text{J K}^{-1} \text{g}^{-1}$)	2.093
	ϕ facotr	9.258
	Start temperature ($^{\circ}\text{C}$)	50
	End temperature ($^{\circ}\text{C}$)	250
	Temperature increment (K)	5
	Waiting time (min)	15
	Searching time (min)	15
	Exothermic threshold (K min^{-1})	0.02
	Logging time ($^{\circ}\text{C}$)	0.5 min
	Pressure limit (kPa)	20000
	Atmosphere	Air, atmospheric pressure
Results	T_o , Exothermic temperature ($^{\circ}\text{C}$)	95.25
	Self heating rate at T_o (K min^{-1})	0.026
	Pressure at T_o (kPa)	264.42
	Temperature at maximum self heating rate ($^{\circ}\text{C}$)	141.84
	Maximum self heating rate (K min^{-1})	1.0552
	Pressure at maximum self heating rate (kPa)	1091.3
	Pressure rising rate at maximum self heating rate (kPa min^{-1})	19.812
	Maximum pressure (kPa)	1415.2
	Maximum pressure rising rate (kPa min^{-1})	19.848
	Temperature at maximum pressure rising rate ($^{\circ}\text{C}$)	142.01
	Time to maximum rate (min)	429.96
	Maximum temperature ($^{\circ}\text{C}$)	155.02
	Adiabatic temperature rise ($^{\circ}\text{C}$)	59.77
	Activation energy (kJ mol^{-1})	147.3

	Heat of decomposition (J g^{-1})	1158
Corrected results	T_{ARC} , Exothermic temperature ($^{\circ}\text{C}$)	76.67
	Time of maximum rate at T_{ARC} (min)	366.68
	Self heating rate at T_{ARC} (K min^{-1})	0.02
	Maximum self heating rate (K min^{-1})	1.2535×10^{10}
	Maximum temperature ($^{\circ}\text{C}$)	647.06
	Adiabatic temperature rise ($^{\circ}\text{C}$)	570.39
	Heat of decomposition (J g^{-1})	1194

c) Weight: 0.750 g

	Date	2009/12/10
Measuring conditions	ARC device	NewARC (TIAX, LLC)
	Operating Institute	AIST
	Operator	Y. S.
	Material of Bomb	Hastelloy C
	Weight of Bomb (g)	20.4096
	Volume of Bomb (mL)	about 9
	Weight of sample (g)	0.7496
	Weight of residue (g)	—
	Specific heat of Bomb ($\text{J K}^{-1} \text{g}^{-1}$)	0.419
	Specific heat of sample ($\text{J K}^{-1} \text{g}^{-1}$)	2.093
	ϕ facotr	6.451
	Start temperature ($^{\circ}\text{C}$)	50
	End temperature ($^{\circ}\text{C}$)	250
	Temperature increment (K)	5
	Waiting time (min)	15
	Searching time (min)	15
	Exothermic threshold (K min^{-1})	0.02
	Logging time ($^{\circ}\text{C}$)	0.5 min
	Pressure limit (kPa)	20000
	Atmosphere	Air, atmospheric pressure
Results	T_o , Exothermic temperature ($^{\circ}\text{C}$)	85.25
	Self heating rate at T_o (K min^{-1})	0.028
	Pressure at T_o (kPa)	236.71
	Temperature at maximum self heating	148.99

	rate (°C)	
	Maximum self heating rate (K min ⁻¹)	2.5137
	Pressure at maximum self heating rate (kPa)	1430.4
	Pressure rising rate at maximum self heating rate (kPa min ⁻¹)	50.992
	Maximum pressure (kPa)	2111.1
	Maximum pressure rising rate (kPa min ⁻¹)	54.440
	Temperature at maximum pressure rising rate (°C)	151.76
	Time to maximum rate (min)	423.91
	Maximum temperature (°C)	169.05
	Adiabatic temperature rise (°C)	83.80
	Activation energy (kJ mol ⁻¹)	113.5
	Heat of decomposition (J g ⁻¹)	1131
Corrected results	T _{ARC} , Exothermic temperature (°C)	64.55
	Time of maximum rate at T _{ARC} (min)	422.02
	Self heating rate at T _{ARC} (K min ⁻¹)	0.02
	Maximum self heating rate (K min ⁻¹)	4.6017 × 10 ⁷
	Maximum temperature (°C)	624.29
	Adiabatic temperature rise (°C)	559.74
	Heat of decomposition (J g ⁻¹)	1171

d) Weight: 1.017 g

	Date	2009/12/7
Measuring conditions	ARC device	NewARC (TIAX, LLC)
	Operating Institute	AIST
	Operator	Y. S.
	Material of Bomb	Hastelloy C
	Weight of Bomb (g)	20.5174
	Volume of Bomb (mL)	about 9
	Weight of sample (g)	1.0170
	Weight of residue (g)	—
	Specific heat of Bomb (J K ⁻¹ g ⁻¹)	0.419
	Specific heat of sample (J K ⁻¹ g ⁻¹)	2.093

	ϕ facotr	5.039
	Start temperature (°C)	50
	End temperature (°C)	250
	Temperature increment (K)	5
	Waiting time (min)	15
	Searching time (min)	15
	Exothermic threshold (K min ⁻¹)	0.02
	Logging time (°C)	0.5 min
	Pressure limit (kPa)	20000
	Atmosphere	Air, atmospheric pressure
Results	T _o , Exothermic temperature (°C)	85.29
	Self heating rate at T _o (K min ⁻¹)	0.031
	Pressure at T _o (kPa)	246.45
	Temperature at maximum self heating rate (°C)	165.28
	Maximum self heating rate (K min ⁻¹)	18.655
	Pressure at maximum self heating rate (kPa)	1867.0
	Pressure rising rate at maximum self heating rate (kPa min ⁻¹)	396.55
	Maximum pressure (kPa)	3000.9
	Maximum pressure rising rate (kPa min ⁻¹)	420.09
	Temperature at maximum pressure rising rate (°C)	168.82
	Time to maximum rate (min)	302.39
	Maximum temperature (°C)	186.19
	Adiabatic temperature rise (°C)	100.9
	Activation energy (kJ mol ⁻¹)	123.8
Heat of decomposition (J g ⁻¹)	1064	
Corrected results	T _{ARC} , Exothermic temperature (°C)	67.22
	Time of maximum rate at T _{ARC} (min)	380.34
	Self heating rate at T _{ARC} (K min ⁻¹)	0.02
	Maximum self heating rate (K min ⁻¹)	1.3213 × 10 ⁸
	Maximum temperature (°C)	592.97
	Adiabatic temperature rise (°C)	525.75

	Heat of decomposition (J g^{-1})	1100
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e) Weight: 1.314 g

	Date	2009/12/16
Measuring conditions	ARC device	NewARC (TIAX, LLC)
	Operating Institute	AIST
	Operator	Y. S.
	Material of Bomb	Hastelloy C
	Weight of Bomb (g)	20.3064
	Volume of Bomb (mL)	about 9
	Weight of sample (g)	1.3142
	Weight of residue (g)	—
	Specific heat of Bomb ($\text{J K}^{-1} \text{g}^{-1}$)	0.419
	Specific heat of sample ($\text{J K}^{-1} \text{g}^{-1}$)	2.093
	ϕ facotr	4.093
	Start temperature ($^{\circ}\text{C}$)	50
	End temperature ($^{\circ}\text{C}$)	253
	Temperature increment (K)	5
	Waiting time (min)	15
	Searching time (min)	15
	Exothermic threshold (K min^{-1})	0.02
	Logging time ($^{\circ}\text{C}$)	0.5 min
Pressure limit (kPa)	20000	
Atmosphere	Air, atmospheric pressure	
Results	T_o , Exothermic temperature ($^{\circ}\text{C}$)	80.18
	Self heating rate at T_o (K min^{-1})	0.025
	Pressure at T_o (kPa)	241.18
	Temperature at maximum self heating rate ($^{\circ}\text{C}$)	167.15
	Maximum self heating rate (K min^{-1})	51.685
	Pressure at maximum self heating rate (kPa)	2159.3
	Pressure rising rate at maximum self heating rate (kPa min^{-1})	1343.0
	Maximum pressure (kPa)	3933.9

	Maximum pressure rising rate (kPa min ⁻¹)	1553.8
	Temperature at maximum pressure rising rate (°C)	185.77
	Time to maximum rate (min)	596.12
	Maximum temperature (°C)	198.00
	Adiabatic temperature rise (°C)	117.82
	Activation energy (kJ mol ⁻¹)	133.8
	Heat of decomposition (J g ⁻¹)	1009
Corrected results	T _{ARC} , Exothermic temperature (°C)	68.92
	Time of maximum rate at T _{ARC} (min)	458.34
	Self heating rate at T _{ARC} (K min ⁻¹)	0.02
	Maximum self heating rate (K min ⁻¹)	1.3866 × 10 ⁸
	Maximum temperature (°C)	562.41
	Adiabatic temperature rise (°C)	493.49
	Heat of decomposition (J g ⁻¹)	1033

f) Weight: 0.733 g

Heating rate: 0.04 K/min

	Date	2009/12/21
Measuring conditions	ARC device	NewARC (TIAX, LLC)
	Operating Institute	AIST
	Operator	Y. S.
	Material of Bomb	Hastelloy C
	Weight of Bomb (g)	20.3064
	Volume of Bomb (mL)	about 9
	Weight of sample (g)	0.7326
	Weight of residue (g)	—
	Specific heat of Bomb (J K ⁻¹ g ⁻¹)	0.419
	Specific heat of sample (J K ⁻¹ g ⁻¹)	2.093
	φ facotr	6.549
	Start temperature (°C)	45
	End temperature (°C)	202
	Temperature increment (K)	5
	Waiting time (min)	30
Searching time (min)	30	

	Exothermic threshold (K min ⁻¹)	0.02
	Logging time (°C)	0.5 min
	Pressure limit (kPa)	20000
	Atmosphere	Air, atmospheric pressure
Results	T _o , Exothermic temperature (°C)	92.00
	Self heating rate at T _o (K min ⁻¹)	0.037
	Pressure at T _o (kPa)	373.61
	Temperature at maximum self heating rate (°C)	146.82
	Maximum self heating rate (K min ⁻¹)	1.8888
	Pressure at maximum self heating rate (kPa)	1329.9
	Pressure rising rate at maximum self heating rate (kPa min ⁻¹)	35.362
	Maximum pressure (kPa)	1684.9
	Maximum pressure rising rate (kPa min ⁻¹)	36.004
	Temperature at maximum pressure rising rate (°C)	148.63
	Time to maximum rate (min)	248.82
	Maximum temperature (°C)	162.70
	Adiabatic temperature rise (°C)	70.70
	Activation energy (kJ mol ⁻¹)	122.9
Heat of decomposition (J g ⁻¹)	969.1	
Corrected results	T _{ARC} , Exothermic temperature (°C)	68.59
	Time of maximum rate at T _{ARC} (min)	356.48
	Self heating rate at T _{ARC} (K min ⁻¹)	0.02
	Maximum self heating rate (K min ⁻¹)	7.1875×10^7
	Maximum temperature (°C)	577.06
	Adiabatic temperature rise (°C)	508.47
	Heat of decomposition (J g ⁻¹)	1064