

# Evaluation of Particulate Generation from Vitrification Process of Ion-Exchange Resin

150

가 (Cold Crucible Melter, CCM) 가  
가 CCM  
CCM

## Abstract

Characteristics of particulate generated from the combustion process of ion-exchange resin in the cold crucible melter were evaluated. Particulate concentration was measured isokinetically right after the CCM, and total particulate amount was evaluated from particulate deposited onto the inside surface of pipe cooler and dust collected in the bottom of high temperature filter after each test. It was possible to determine indirectly the combustion efficiency of ion-exchange resin in the CCM from the weight of unburned carbon and color of collected particulate. The effect of particulate concentration on the pressure drop across the high temperature filter was also investigated.

1.

가

가 (Cold Crucible Melter, CCM)

1/25  
10 100

가 CCM

가 CCM (CO, CxHy)

(HCl, SOx) HEPA/ 가

(NOx)

2.

가 CO, SOx, NOx, O<sub>2</sub> 가

가 (Vs)

(Vn) Vs < Vn

( > 100 %) 가

Vs > Vn ( < 100 %) 가

가

95

110% Fig. 1

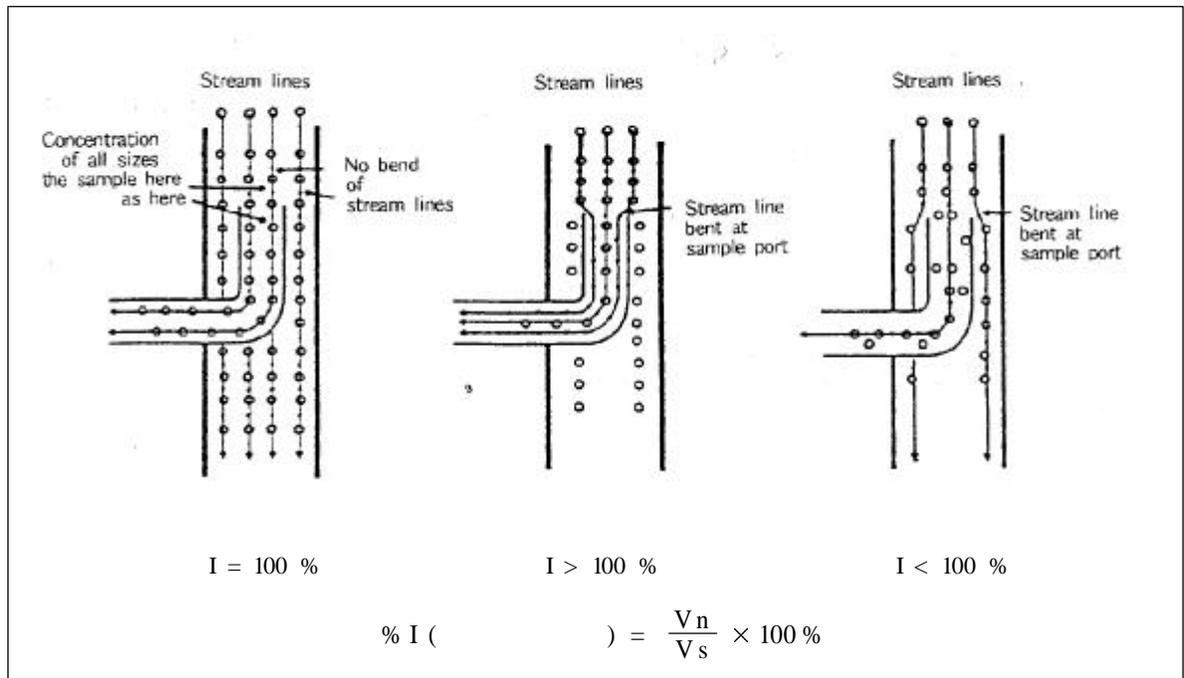


Fig. 1

가 (CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>),  
 CCM (K-Factor)  
 K-factor

Fig. 2  
 (probe), 가 (impinger train), 가

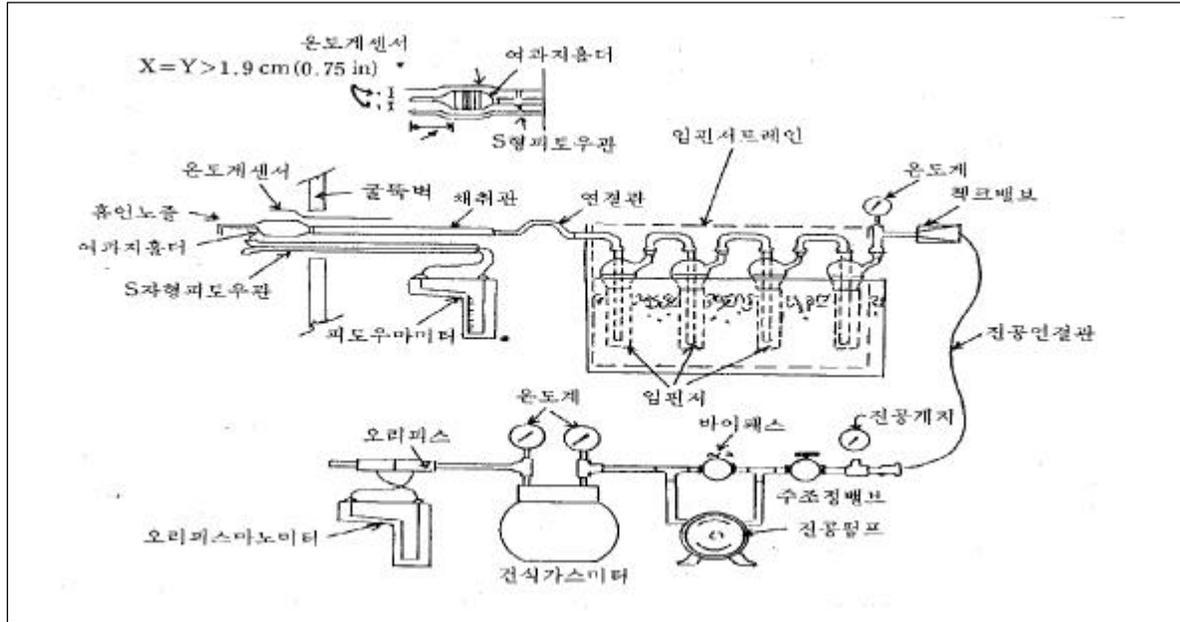


Fig. 2

CCM 105 1 10

$$C_n = \frac{m_d}{V_m \times \frac{273}{273 + \theta_m} \times \frac{P_a + \Delta H / 13.6}{760}}$$

C<sub>n</sub> : ( g/m<sup>3</sup> dry)  
 m<sub>d</sub> : (g)  
 V<sub>m</sub> : 가 가 (m<sup>3</sup>)  
 m : 가 ( )  
 P<sub>a</sub> : (mmHg)  
 H : (mmH<sub>2</sub>O)

3.

CCM  
 CCM 가  
 가  
 CCM  
 Table 1 CCM 30 1 10  
 CCM

Table 1

				(g)	(g/Nm <sup>3</sup> )	(g/hr)	
# 1	20 kg/h	DWT01	2hr 25min	0.510	3.446	137.84	
		DWT02	1hr <sup>1)</sup>	0.164	2.796	111.84	
		DWT03	2hr	0.059	1.007	45.32	
# 2	20/30 kg/h	DWT04	2hr 15min	0.134	1.937	87.17	
		DWT05	4hr 43min	0.278	3.301	165.05	
		DWT06	30min <sup>1)</sup>	0.206	2.684	144.94	
		DWT07	1hr	0.325	2.918	157.57	
	30 kg/h	DWT08	2hr 42min	0.482	4.732	307.58	
# 3	30 kg/h (Cs, Co )	DWT14	2hr 20min	0.374	5.157	309.42	
# 4	40 kg/h (Cs, Co ) (with glass)	DWT15	2hr 20min	1.217	18.350	1468.00	
		DWT16	30min <sup>1)</sup>	0.255	4.030	282.10	
		DWT17	1hr 30min	0.590	9.560	717.00	
		DWT18	40min	0.464	4.780	363.28	
		DWT19	1hr 20min	1.337	14.45	1213.80	
		DWT20	2hr	1.536	16.58	1492.20	
# 5	40 kg/h	with glass	DWT21	45min	0.209	2.903	226.40
			DWT22	30min <sup>1)</sup>	0.321	4.641	357.36
			DWT23	1hr 15min	0.300	4.323	332.87
		without glass	DWT24	40min	0.317	4.614	276.84
			DWT25	1hr 20min <sup>2)</sup>	0.563	7.890	473.40
			DWT26	30min <sup>1)</sup>	0.376	5.734	344.04
			DWT27	1hr 10min	1.420	23.359	1705.21
			DWT28	2hr	1.832	30.157	2201.46

Note>

- 1) 가
- 2) 40

# 1 # 2 가 가

# 3 40 80 (DWT 09 가

DWT 13) 가

0.3µm CCM

99.9% # 3

가 (retention)

# 4 CCM / bubbler

# 5 CCM bubbler 가 가 .  
 가  
 DWT 25 ( 40 )  
 , CCM 1 2  
 , # 5 CCM 30 DWT 26  
 , 2 DWT 28  
 CCM  
 Table 1 가 CCM  
 가 1 2 가 CCM  
 가 CCM 가  
 300 400 가  
 CCM 가  
 가

4.

CCM  
 가 200mm Fig. 3 0.155m  
 4 80mm

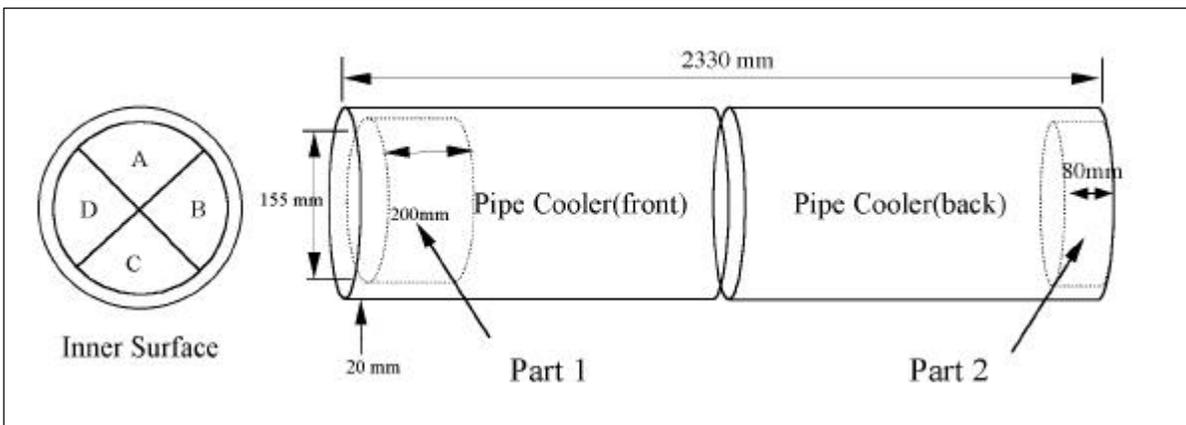


Fig. 3

Table 2

(condensation)

Table 2.

	Part 1 ( 200mm)						Part 2 ( 80mm)						3)
	C (%)	S (%)	SiO <sub>2</sub> (%)	Na (%)	(%)	1) (g)	C (%)	S (%)	SiO <sub>2</sub> (%)	Na (%)	(%)	1) (g)	
# 1	13.88	6.87	2.0	24.08	2.25	38.92	-	-	-	-	-	-	453.40
# 2	9.5	10.1	0.89	23.42	-	31.81	3.88	3.07	2.91	14.84	-	24.28 <sup>2)</sup>	494.12
# 3	15.23	3.2	1.99	20.52	2.0	52.43	18.49	5.3	1.42	18.49	4.35	10.24	452.91
# 4	-	-	10.2	38.86	2.3	65.93	-	-	0.5	25.85	4.0	18.97	660.30
# 5	8.92	12.40	1.45	40.75	2.0	47.23	3.82	10.44	1.14	39.21	2.1	10.68	430.64

Note>

- 1) 155mm 가 2,330mm 200mm , 80mm
- 2) # 1 # 2
- 3) .

가 1m/ sec 가 Na<sub>2</sub>O 가 B<sub>2</sub>O<sub>3</sub> 1μm 99.9% 가 Fig. 4 # 4 가 10 20mmH<sub>2</sub>O (candle) Fig. 5 # 5 10 20 mmH<sub>2</sub>O 가 가 CCM 가 (DWT 27, DWT 28) 가 CCM

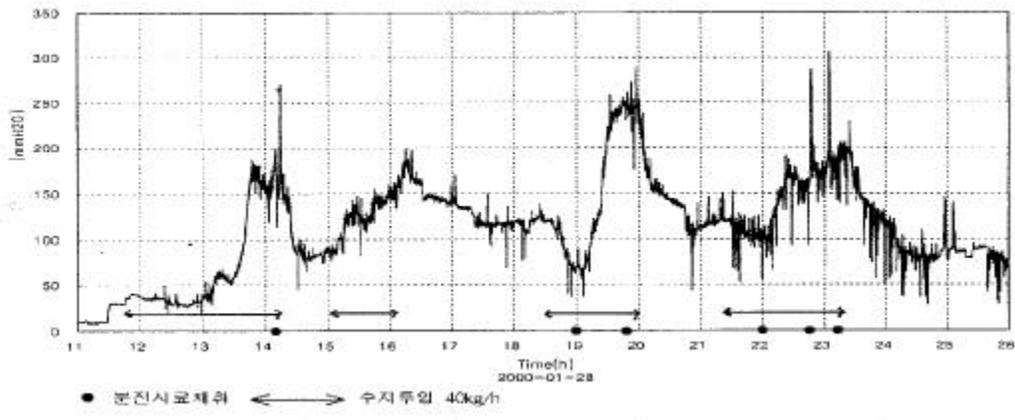


Fig. 4 # 4

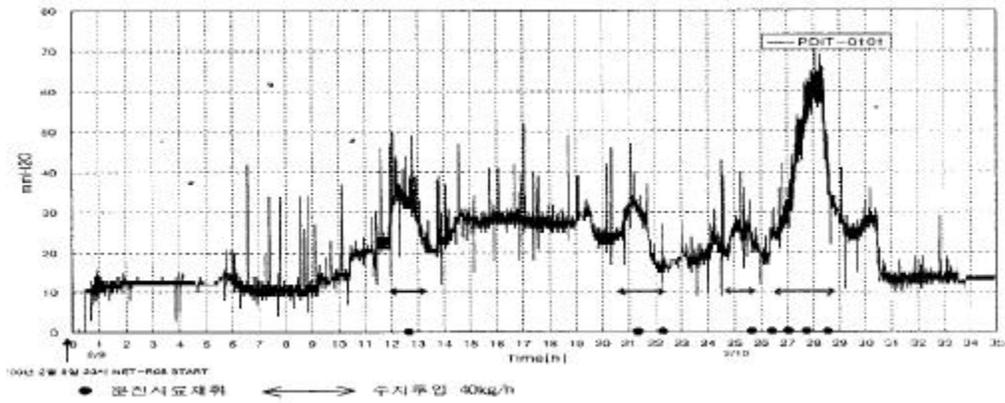


Fig. 5 # 5

Table 3 CCM

Table 3.

		Resin	Resin (kg)	(g)	HTF ash (kg)	ash ( g / kg resin )
# 1	7hr 45min	6hr 25min	128	453.40	2.70	24.63
# 2	8hr 57min	8hr 57min	182	494.12	3.00	19.20
# 3	9hr 30min	7hr 50min	230	452.91	3.26	16.14
# 4	11hr 40mon	6hr 50min	272	660.30	5.21	21.58
# 5	16hr 25min	5hr 35min	215	430.64	6.93	34.23

Table 3

CCM

# 3

2.418kg

3.71kg

1 40

1.29kg 가

21 25g/kg resin

1

1

1%

가

150 200

1

CCM

0.3 5%

가

1

5%)

CCM (

( 1% )

( 3% )

CCM

5.

가 CCM  
 가 CCM  
 CCM  
 가  
 가 CCM 가  
 가 300 400 CCM CCM 가  
 CCM 8g/Nm<sup>3</sup> 가  
 (batch-type)  
 Na<sub>2</sub>O 가  
 150 200  
 가 CCM  
 1 가 # 4 200mmH<sub>2</sub>O  
 가 10 20mmH<sub>2</sub>O CCM 100  
 가 가  
 DAW 가

6.

[1] ( ), , 1998. 10  
 [2] ( ), , 1999. 12  
 [3] ( ),  
 [4] Kenneth Wark and Cecil F. Warner, "Air Pollution, Its Origin and Control", 1981