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An Experiment on Particle Collection Characteristics of a Duct-type Wet Scrubber

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Key Words: Duct-Type Wet Scrubber(), DOS particle(DOS), NaCl particle(NaCl), Pressure Drop(), Collection Efficiency()

Abstract

DOS and NaCl aerosol particles with geometric mean diameter of 0.1~3.0 μm geometric standard deviation of 1.1~1.8 and total number concentration of 450~400 particles/cm³ were used to determine collection efficiencies of a duct-type wet scrubber with respect to particle size. The tested operating variables included air velocity and water injection rate. It was shown from the experimental results that the collection efficiencies increased with increasing water injection rate and decreasing air velocity. It was also seen that the collection efficiency of the Duct-type wet scrubber is mainly governed by the mechanism of inertial impaction.

1.

$(C)_{inlet}$: 가 가
[particles/m³ 가

$(C)_{outlet}$: (wet scrubber) .
[particles/m³ 가

U : [m/s] 가 ,
 W : [L/min] 가

궤 : (inertial impaction)
가 1 μm

†
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* ()

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tower)

(spray

(counter-current) (co-current) (vertical-current) (vertical-current) (GMD) 0.13 μm NaCl , 0.78 μm , 1.0 μm , 1.4 μm , 3.02 μm (GSD)가 1.1 가 , 1.3 DOS 가

HEPA 15 cm 30 cm 0.5 in DOS 10 cm

Fig. 2

DOS Condensation Monodisperse Aerosol Generator(CMAG ; Model 3470, TSI, Inc., St. Paul, MN,USA) LaMar-sinclair

2.

2.1

Fig. 1

1.1

가

NaCl

(4)

(mist arrestor)

NaCl

가

(bubbler)

(reheater)

가

가

3

DOS

가

DOS

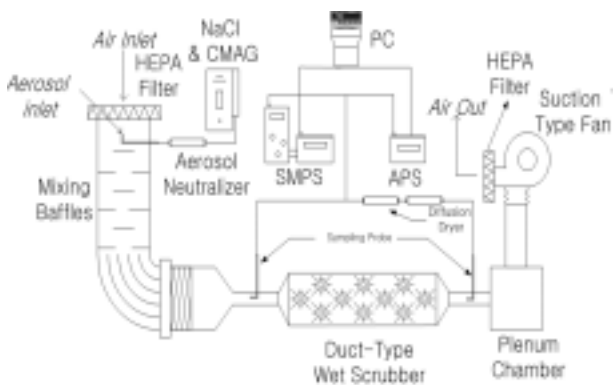


Fig. 1 Schematic diagram of the present experimental apparatus.

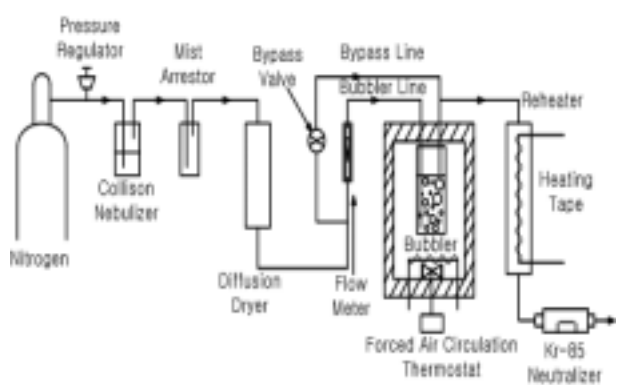


Fig. 2 Schematic diagram of the DOS aerosol generating system.

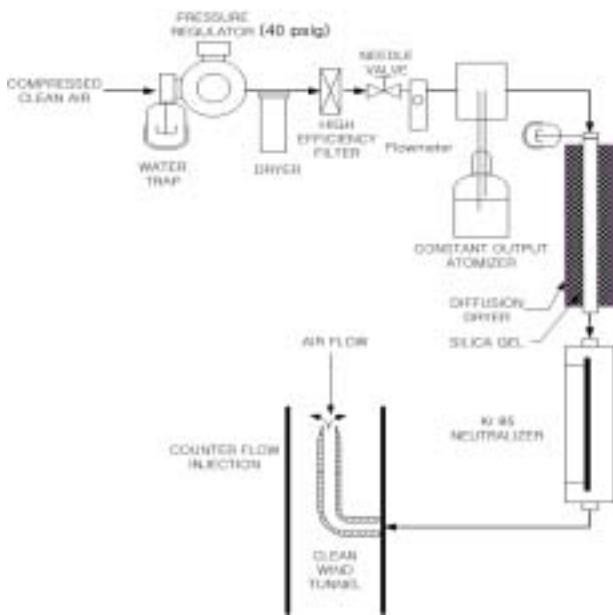


Fig. 3 Schematic diagram of system used for generating NaCl submicron aerosols.

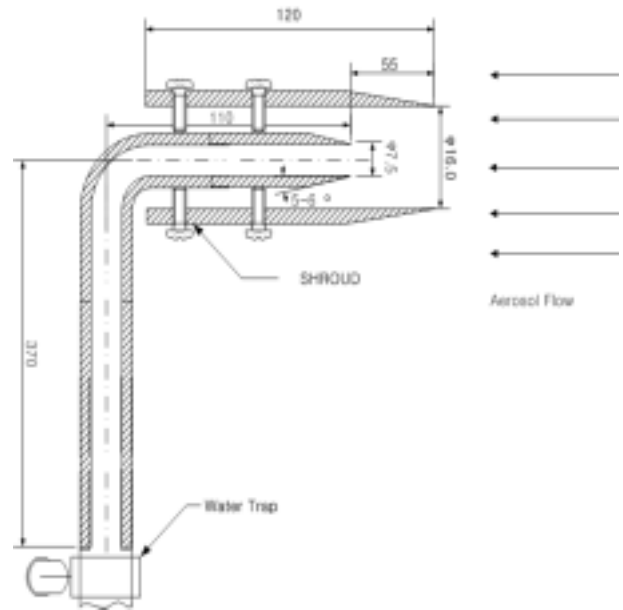


Fig. 4 Schematic diagram of the shrouded sampling probe.

. CMAG

Okazaki Willeke⁽⁵⁾ Gong⁽⁶⁾

Fig. 4 Willeke-type Shrouded probe

가

(7)

Fig. 3 (NaCl) Constant Output Atomizer(COA ; Model 3076, TSI, Inc., St. Paul, MN,USA) 가 Water trap 가 Dryer Pressure Regulator 40 psi 1.1 l/min 가 COA 0.343 mm

Fig. 5 (Full Con type 120°) 120° 가 1.9 mm

NaCl

APS SMPS

diffusion dryer Kr-85 Neutralizer NaCl 가

$$\eta = \frac{(C)_{inlet} - (C)_{outlet}}{(C)_{inlet}} \quad (1)$$

η , $(C)_{inlet}$, $(C)_{outlet}$

Fig. 4

$U = 3 \text{ m/s}$, $W = 30 \text{ L/min}$, (U)

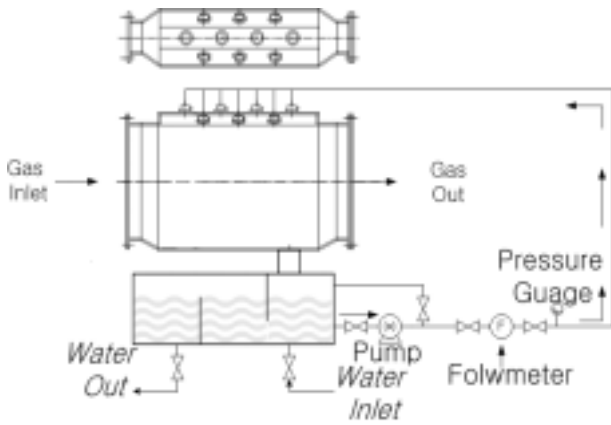


Fig. 5 Schematic diagram of the present duck-type wet scrubber.

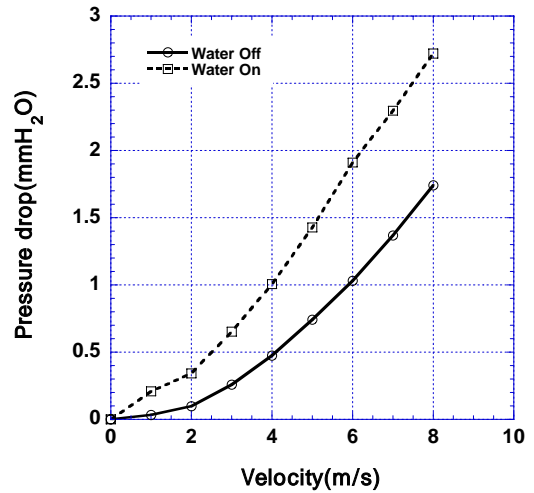


Fig. 6 Pressure drop across the wet scrubber.

(W)

3.2

3.

Fig. 7 Fig. 8

1m/s 3m/s

DOS

3.1

, Table 1 Fig. 7 Fig. 8

Fig. 7

8

(GMD),

(TNC),

(GSD)

가

가

가

2 mmAq

가

, Table 1

3

,

가 3 가

2~3

가

(4)

90%

Table 1 Geometric mean diameter, total number concentration and geometric standard deviation with bubbler and reheater temperatures

	GMD(μ m)		TNC(particles/cm ³)		GSD	
	1 m/s	3 m/s	1 m/s	3 m/s	1 m/s	3 m/s
NaCl , 100 g/L	0.13	0.13	2003	980	1.77	1.75
Tb=160°C, Tr=130°C	0.78	0.77	1150	462	1.19	1.17
Tb=180°C Tr=150°C	1.00	0.99	2350	1150	1.26	1.23
Tb=200°C Tr=160°C	1.4	1.35	2200	1130	1.23	1.21
Tb=250°C Tr=220°C	3.00	3.03	1710	716	1.36	1.35

4.

가 1.1~1.3 DOS
 가 1.7 NaCl 가

1~4 m/s,

0~4 L/min

1) 가 3 m/s ,
 가 가 .

2) 가

3) 90% 가 .

5.

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