

하 권 철

Characteristics of Airborne Asbestos and Radon Concentrations in the Underground Spaces in Gyeongnam Province

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The purpose of this research is to characterize airborne asbestos and radon concentrations as trace toxic air pollutant in the underground spaces in Gyeongnam province. Air samples of asbestos and radon were taken in the three underground spaces for ten months from April 2003 to January 2004. The IAQ(Indoor Air Quality) of underground spaces were controlled using central ventilation (supply/exhaust) system. The levels of geometric means of airborne asbestos and radon concentrations in three sampling spaces

were below the standards of Korean Ministry of Environment. However, one sample of airborne asbestos in underground spaces "C", which was used fire proofing fibrous material, was in excess of the standard. There are significantly statistical differences in levels of trace toxic air pollutants by sampling spaces($p<0.05$).

Key Words: Asbestos, Radon, Indoor Air Quality, Underground Space

I. 서 론

1970

, 가

가 가

(Indoor Air Quality, IAQ),
(Tight Building Syndrome-TBS,
Sick Building Syndrome-SBS,
(Indoor Environmental Quality, IEQ),
(Building-Related Disease, BRD)
(Hines
, 1993; McCarthy , 1998; Spengler ,
1991).

21
(indoor environment)

,

가

ACGIH
A1(, confirmed
human carcinogen) (, 1989, , 2002; ACGIH, 2004).

II. 연구 대상 및 방법

1. 연구 대상

가 , 70 가
ASHRAE(American Society of Heating, Refrigerating, Air Conditioning Engineers) (acceptable air quality) , , , , (2 , 1) 2003 4 2004 1 10
“ , , 가 가 .
(80%) , Po-218
” Po-214
(ASHRAE, 1999). (non-indus- 가
trial environments) ,

2. 연구 방법

가 (NIOSH)
가 20% (NCRP) (EPA)
13 5
~ 2
가 . 1) 덕면
NIOSH “NIOSH 7400”
가 , (membrane filter, SKC)
(Gilian, HFS, USA) 2.5 /min
가 가 6
(, 1989; , .
2002; EPA, 2004).
(Wolkoff, 1992; Harrje, 1991). 1970 (防火) 5 μ m
가 3:1
가 (Gilian, USA)
가 (Hines, 1cc
(Mesothelioma, 1993; Ryan , 1994). (/cc)
(Asbestosis)가 (NIOSH, 1994).
가
가 ,
가 20~30
가 E-Perm
Electret Radon Monitor System(RAD Elec
Inc.) 48

Table 2. Geometric mean, geometric standard deviation, and range of airborne asbestos concentrations by sampling space
(standard : 0.01f/cc)

Sampling site	No. of sample	Asbestos Concentration, f/cc		
		GM	GSD	Range
A	14	0.0019	3.979	<0.001~0.007
B	12	0.0006	4.736	<0.001~0.004
C	14	0.0025	3.553	<0.001~0.012

0.01 f/cc 가 .
 LOD 0.001 f/cc (p<0.05). 가
 "A" 0.007 f/cc "C" 1.981
 ,
 0.0019 f/cc, "B" 0.004 f/cc
 W-test
 0.0006 f/cc 가 (Mulhausen , 1998). 가 가
 , "C" 0.012 f/cc . 2001 가
 0.0025 가
 f/cc 가 (2). 가 3 가
 "C" 가 EPA, ASHRAE , , , , ,
 1 4 pCi/ , , , , ,
 "A" , , , 가 가
 0.475~1.742 pCi/ , , 가 가
 1.053 pCi/ , "B" 0.301~1.005 pCi/ 2 pCi/
 (p=0.027). "C" (, 2002). 1989
 0.423 pCi/ , "C"
 가 0.047~1.981 pCi/
 0.603 pCi/ . "A" 가, ,
 NIOSH 7400 가 1.6 pCi/

가
 (1989) 가
 0.008 f/cc 가
 (2002)
 , , , , ,
 , , 가
 , 가
 , 가

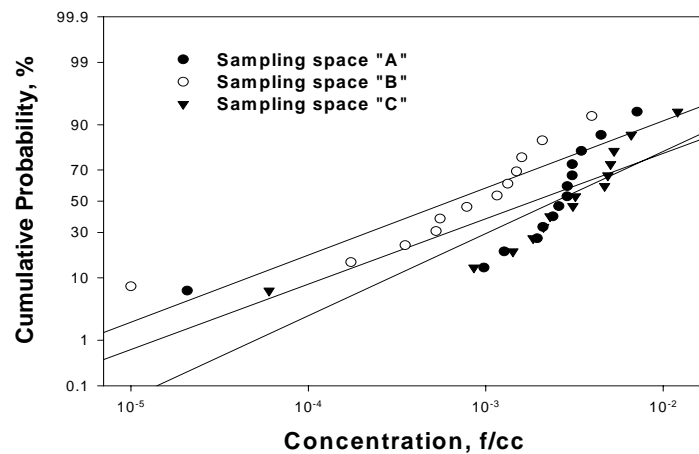


Fig. 1. The cumulative probability of airborne asbestos concentrations by sampling space.

Table 3. Geometric mean, geometric standard deviation, and range of radon concentrations by sampling space (standard : 4 pCi/)

Sampling site	No. of sample	Radon concentration, pCi/		
		GM	GSD	Range
A	11	1.053	1.467	0.475~1.742
B	11	0.423	2.142	0.301~1.005
C	11	0.603	2.638	0.047~1.981

(, 1989).

가 (p<0.05).
가 5.

IV. 결 론

가 3 가 가 가
가 가
2003 4 2004 1

가 , ,
가 1. 감사의 글
가 가
가 ASHRAE
2004

“ 2.
”
3. 40 12 ,
1 가
0.01 f/cc , 1989.
2003 7 , , , ,
‘ 4 “A”, "B", "C" 0.0019 f/cc, 0.0006 (ETS)
, f/cc, 0.0025 f/cc
2003;13(2)152~159

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(p<0.05).
가 "C" 가
0.012 f/cc
4. "A", "B",
"C" 1.05 pCi/ , 0.42 pCi/ ,
가 0.60 pCi/
American Conference of Governmental
Industrial Hygienists(ACGIH), 2004
Threshold Limit Values for Chemical
and Physical Agents, and Biological
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American Society of Heating, Refrigerating

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