# Calculation For The Concentration In Ambient Air

## *Conversion Equation:*

NO concentration (ppb) = $\alpha_{NO} \times ( W_{NOx} - W_{NO2} ) / t$
$NO_2$ concentration (ppb) = $\alpha_{NO2} \times W_{NO2} / t$
$SO_2$ concentration (ppb) = $\alpha_{SO2} \times W_{SO2} / t$
$NH_3$ concentration (ppb) = $\alpha_{NH3} \times W_{NH3} / t$
$O_3$ concentration (ppb) = $\alpha_{O3} \times W_{O3} / t$

Where:
$W_{Nox}$,$W_{NO2}$: $NO_2$ quantity (ng) collected in NOx and $NO_2$ collection elements
$W_{SO2}$ : $SO_2$ quantity (ng) collected in $SO_2$ collection element
$W_{NH3}$ : $NH_3$ quantity (ng) collected in $NH_3$ collection element
$W_{O3}$:$O_3$ quantity (ng) converted from $NO_3$ quantity collected in $O_3$ element
$\alpha_{NO}$, $\alpha_{NO2}$, $\alpha_{SO2}$, $\alpha_{NH3}$, $\alpha_{O3}$: ppb concentration conversion coefficient
( ppb·min / ng ) normally at 20℃, R.H. 70% to be based.

$\alpha_{NO}$= 60, $\alpha_{NO2}$ = 56, $\alpha_{SO2}$ = 39.4, $\alpha_{NH3}$= 43.8, $\alpha_{O3}$= 46.2
These values were obtained by a theoretical calculation and an experimental basis using a glass chamber. These values are also changeable depending on temperature, humidity and exposure time.

t : exposure time ( min )

## *Calculation Of Concentration Conversion Coefficients For NO And $NO_2$*

**In order to enhance the accuracy of Ogawa sampler measurement method**

$\alpha_{NO}$ and $\alpha_{NO2}$ can be calculated for a combination f temperature and relative humidity using the following formulas:

$$\alpha_{NO} = \frac{10000}{( - 0.78 \text{ X } [P] \text{ X } [RH] ) + 220}$$

$$\alpha_{NO2} = \frac{10000}{( 0.677 \text{ X } [P] \text{ X } [RH] ) + ( 2.009 \text{ X } [T] ) + 89.8}$$

[T] : Ambient temperature in degree Centigrade
[RH] : Relative humidity %

$$[P] = \left\{ \frac{2P_N}{P_T + P_N} \right\}^{2/3}$$

$P_N$: 17.535 ( water vapor pressure in mm Hg at 20 degC
$P_T$: Vapor pressure of water at the ambient temperature [T]

## *Calculation Of Concentration Conversion Coefficients For $SO_2$, $NH_3$ And $O_3$*

$\alpha_{SO2} = 39.4 \text{ X } ( 293 / ( 273 + T ) )^{1.83}$
[T] : Ambient temperature in degree Centigrade

$\alpha_{NH3} = 43.8 \text{ X } ( 293 / ( 273 + T ) )^{1.83}$
[T] : Ambient temperature in degree Centigrade

$\alpha_{O3} = 46.2 \text{ X } 10^2 \text{ X } ( 293 / ( 273 + T ) )^{1.83} / ( 9.94 \text{ X ln } (t) - 6.53 )$
[T] : Ambient temperature in degree Centigrade
t : Exposure time (min)