Calculation of Gas Volume under normal Pressure

Prof. Dr. Werner Bidlingmaier & Dr.-Ing. Christian Springer

Projekt Orbit | Dr. W. Bidlingmaier | Bauhaus Universität Weimar | www.orbit-online.net

$$C_{(x)} = \frac{0{,}01203 * V_{(x)} * M_{(x)} * p_{(x)}}{T_{(x)}}$$

$C_{(x)}$	Concentration of the Gas Component	[mg/m³]
$V_{(x)}$	relative Concentration of the Gas Component	[ppm]
$M_{(x)}$	Molar Mass of the Gas Component	[g/mol]
$p_{(x)}$	Pressure of the Gas Component	[mbar]
	(p = 1013,23 mbar under normal pressure)	
$T_{(x)}$	Temperature of the Gas Component	[K]
	(T = 273,15 K under normal pressure)	

Example :

Question: How much ppm represents 1 mg/l CH_4 (Methan) under normal pressure?

Calculation:

$$V_{(X)} = \frac{1{,}0 * 273{,}15}{0{,}01203 * 16{,}042 * 1013{,}25} = 1{,}396\, ppm$$

The molar Mass can determined with the help of the Mendeleev's table:

C	= 12,010 g/mol
4 · H = 4 · 1,008	= 4,032 g/mol
Σ	= 16,042 g/mol