Applications of Molecular Spectrum Detection on Environment Control

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Additional Informations

Method	Trace Gas (3s)/Ave. Time	Limit of Detection	Precision (1 s)	Overall Accuracy
Differential optical absorption spectroscopy	NO_3	2 ppt/10 m	—	—
	NO_2	4 ppb/12 m	—	± 15%
	HONO	0.6 ppb/12 m	—	± 30%
	OH	0.02 ppt/2 m	1% @ 0.2 ppt	± 25%
	SO_2	20 ppt/10 m	—	—
	CH_2O	400 ppt/10 m	—	—
	O_3	4 ppb/10 m	—	—
Fourier transform IR spectroscopy	CH_4	(ambient)/1 m	0.2% @ 2 ppm	± 5%
	HNO_3	4 ppb/15 m	—	± 10%
	VOCs	1 to 100 ppb	—	—
Tunable diode laser absorption spectroscopy	NO	1 ppb/1 s	5% @ 10 ppb	± 15%
	NO_2	0.5 ppb/1 s	5% @ 10 ppb	± 15%
	O_3	2 ppb/1 s	5% @ 30 ppb	± 15%
	HNO_3	240 ppt/10 m	10% @ 1 ppb	± 15%
	CH_4	(ambient)/1 s	0.1% @ 2 ppm	± 15%
	C_2H_6	300 ppt/1 s	10% @ 1 ppb	± 15%
	CH_2O	100 ppt/5 m	5% @ 1 ppb	± 15%
	CO	(ambient)/5 s	1% @ 50 ppb	± 15%
Nondispersive IR absorption	CO	(ambient)/1 h	2% @ 200 ppb	—
	CO_2	(ambient)/10 s	0.1%	—
Laser induced fluorescence	OH	0.01 ppt/60 s	5–15%	± 16%
	HO_2	0.005 ppt/30 s	30%	± 50%
	NO_2	280 ppt/2.5 m	—	± 15%
	NO	< 5 ppt		
UV absorption	O_3	1 ppb/ 10 s	—	± 3%
VUV fluorescence	CO	2 ppb/ 10 s	—	—

Table 2. Typical target species and detection limits for atmospheric spectroscopic sensors.

References

[1] J.W. Rohlf, *Modern Physics from α to Z^0*, John Wiley & Son, Inc. (1994).

[2] E. Hecht, *Optics*, Addison-Wesley Publishing Company (1990).

[3] E.R. Cespedes and C.E. Kolb, "Environmental Sensors", Opt. & Phot. News (Aug .1998)