

NERVE AGENT MEASUREMENTS BY PID

Introduction

Many nerve agents and related compounds can be detected by PID. The table below lists some common agents and several of their physical properties and PID Correction Factors (CF). The CF is used by calibrating the instrument with isobutylene, and then multiplying the reading by the CF to obtain the true concentration (See Technical Note 106 for full details)

Discussion and Conclusions

All the listed compounds can be detected with a 10.6 eV lamp, except phosgene, which requires an 11.7 eV lamp and HCN and ClCN, which cannot be detected by PID. VX has inherent sensitivity, but it is too heavy a compound to get to

the PID sensor and thus cannot be reliably measured. The 8-hr TWA's are extremely low, and the PID cannot measure nerve agents at these levels. However, it can locate sources and detect the agents at levels well below levels that are lethal in one minute (see LC 50 in table). Compounds with low vapor pressures will tend to respond more slowly on the PID, in some cases requiring several minutes. In the case of VX the lethal dose is above its vapor pressure at room temperature; therefore the lethal one-minute dose can be attained only if the air is hot or the chemical is sprayed as an aerosol. At the maximum concentration, more than one minute exposure is required for lethal effects.

Compound	Structure	m.w.	Lamp (eV)	CF	8-h TWA (mg/m ³)	8-h TWA (ppbv)	LC50 (ppmv-min.)	Vapor Press. (ppmv)
Arsine (SA)	AsH ₃	78	10.6	1.9	0.16	0.05		Gas
Hydrogen Cyanide	HCN	27	ND**	ND**	11	10,000	270	Gas
Cyanogen Chloride	ClCN	61.5	ND**	ND**	0.6 C ^ξ	300 C ^ξ		
Lewisite	ClCH=CHAsCl ₂	207	10.6	~1*	0.003	0.35	140	460
Mustard (HD)	S(EtCl) ₂	159	10.6	0.6	0.003	0.46	>230	95
N Mustard (HN-1)	N(Et)(EtCl) ₂	172	10.6	~1*				
Phosgene	O=CCl ₂	99	11.7	~2*	0.4	100		Gas
Sarin (GB)	O=PF(Me)(OiPr)	140	10.6	3	0.0001	0.017	12	3800
Soman (GD)	O=PF(Me)(OCH(Me)(tBu))	182	10.6	~3*	0.00003	0.004	9	530
Tabun (GA)	O=P(CN)(OEt)(NMe ₂)	162	10.6	0.8	0.0001	0.015	20	48
VX	O=P(Me)(OEt)(SetN(iPr) ₂)	267	10.6	~0.5*	0.00001	0.00091	2.7	0.92
GF	O=PF(Me)(O-Cyclohex)	180	10.6	~3*				
DMMP	O=P(Me)(OMe) ₂	124	10.6	4.3				
Triethyl phosphate	O=P(OEt) ₃	182	10.6	3.1				
Methyl salicylate	2-(HO)C ₆ H ₄ CO ₂ Me	152	10.6	0.9				

* Estimated value. ** ND = Not Detectable by PID. ^ξC = ceiling value.