RELATIVE SENSITIVITY OF BAYARD-ALPERT IONIZATION GAUGES TO VARIOUS GASES

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The ion current I_+ in a hot-cathode ionization gauge is given by $I_+ = KI_eP$. The gauge constant is $K = (I_+/I_e)(1/P)$, where I_e is the electron current, and P the pressure. The sensitivity is given by $S = KI_e = I_+/P$. The constant K is independent of pressure below about 10^{-3} Pa.

Relative sensitivities for different Bayard-Alpert ionization gauges may differ by as much as ± 15% as a result of differences in applied voltages, electron current, and electrode structure. The table below presents the average of the measurements of 12 experimenters on Bayard-Alpert ionization gauges in various gases. The sensitivity relative to nitrogen is tabulated.

Gas		Relative sensitivity $S/S(N_2)$
Helium	He	0.18
Neon	Ne	0.31
Argon	Ar	1.4
Krypton	Kr	1.9
Xenon	Xe	2.7
Nitrogen	N_2	1.00
Hydrogen	H_2	0.43
Oxygen	O_2	0.96
Carbon monoxide	CO	1.0
Carbon dioxide	CO_2	1.4
Water	H_2O	0.93
Sulfur hexafluoride	SF_6	2.3
Mercury	Hg	3.5
Methane	CH_4	1.6
Ethane	C_2H_6	2.6
Propane	C_3H_8	3.5
Butane	C_4H_{10}	4.3
Ethene	C_2H_4	1.3
Propene	C_3H_6	1.8
Acetylene	C_2H_2	0.61
Allene	C_3H_4	1.3
1-Propyne (Methyl acetylene)	C_3H_4	1.4
Benzene	C_6H_6	3.8

References

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