

TABLE 2.3: δ values of some common stable isotope reference standards.

Reference standard	Substance	$\delta^{18}\text{O}$ (SMOW)	$\delta^{15}\text{N}$ (PDB)	$\delta^{13}\text{C}$ (PDB)	δD (SMOW)
VSMOW (Standard Mean Ocean Water)	water	= 0.00			= 0.00
SLAP (Standard Light Antarctic Precipitation)	water	= -55.50			= -428.00
GISP (Greenland Ice Sheet Precipitation)	water	-24.78			-189.73
NBS-19	calcite	28.64	= -2.20	= +1.95	
NBS-18	calcite	7.20	-23.00	-5.01	
IAEA-CO-1	calcite	28.39	-2.44	2.48	
IAEA-CO-8	calcite	7.54	-22.67	-5.75	
USGS-24	graphite			-15.99	
NBS-27	oil			-29.74	
IAEA-S-6	sucrose			-10.43	
NBS-28	quartz	9.58			
NBS-30	biotite	5.24			-65.7
		$\delta^{18}\text{O}$ (SMOW)	$\delta^{15}\text{N}$ (AIR)	$\delta^{34}\text{S}$ (CDT)	
NBSVEC	N ₂ gas		-2.77		
NBS-14	N ₂ gas		-1.18		
IAEA-N-1	(NH ₄) ₂ SO ₄		0.43		
IAEA-N-2	(NH ₄) ₂ SO ₄		20.32		
IAEA-ND-3	KNO ₃	25.3	4.69		
IAEA-S-1	Ag ₂ S			= -0.30	
IAEA-S-2	Ag ₂ S			22.67	
AEA-S-3	Ag ₂ S			-32.55	
NBS-123	sphalerite			17.44	
NBS-127	BeSO ₄	8.7		21.1	

A complete set is given in Appendix 1.

TABLE 2.5: Gases commonly measured in conventional gas source isotope ratio mass spectrometers.

Element	Gas	Masses of isotopologues measured
Hydrogen	H ₂	2, 3 (interference from H ₂ ⁺)
Carbon	CO ₂	44, 45, and 46
Nitrogen	N ₂	28, 29 (and 30)
Oxygen	CO ₂	44, 45, 46
	O ₂ (fluorination)	32, (33), 34
	CO (pyrolysis)	28, 30
Sulfur	SO ₂	64, 66
	SF ₆	146, (147), 148, (150)

TABLE 2.6: Masses and possible configurations of CO₂ isotopologues.

Mass	Isotopologue
44	¹⁶ O ¹² C ¹⁶ O
45	¹⁶ O ¹³ C ¹⁶ O, ¹⁷ O ¹² C ¹⁶ O, ¹⁶ O ¹² C ¹⁷ O
46	¹⁷ O ¹³ C ¹⁶ O, ¹⁶ O ¹³ C ¹⁷ O, ¹⁷ O ¹² C ¹⁷ O, ¹⁸ O ¹² C ¹⁶ O, ¹⁶ O ¹² C ¹⁸ O

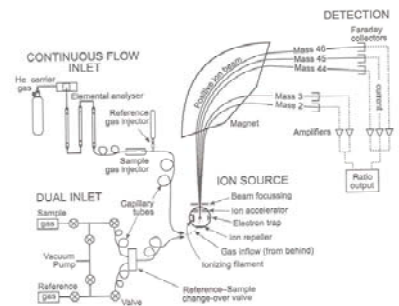
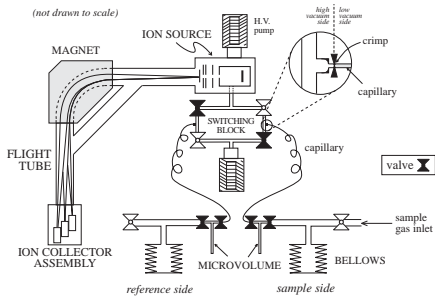


Fig. 1-4 Schematic of a gas source isotope ratio mass spectrometer (IRMS), showing both continuous flow and dual inlet. The continuous flow inlet here is shown with a sample combustor and gas chromatograph configuration. Capillary tubes ensure laminar, non-disrupting gas flow. Example shows mass range of CO₂ gas, and includes the short radius flight tube for ¹²C. Based on many designs. Other mass ranges (for N₂ and N₂O) are obtained by other additional fluid injection, ionizer adjustments or by adjusting the beam. For manufacturers details, see: <http://webgate.crj.com/irms/irms.htm>.

• Clark and Fritz, 1997

Dual Inlet MS



Continuous-Flow MS

