

Appendix 1.

Standard Reference Materials for Stable Isotopes.

Isotopic composition of selected reference materials after the compilation of Coplen *et al.* (2002) and data from IAEA. Additional standards not presented here have been made, however they are not official IAEA-approved. Additional IAEA standards are developed continually. Refer to the IAEA website for up-to-date delta values.

Reference Standard	Substance	$\delta^{18}\text{O}$ (VSMOW)	$\delta^{18}\text{O}$ (VPDB)	$\delta^{13}\text{C}$ (VPDB)	δD (VSMOW)
VSMOW, VSMOW2 (Standard Mean Ocean Water)	water	$\equiv 0.00$			$\equiv 0.00$
SLAP (Standard Light Antarctic Precipitation)	water	$\equiv -55.50$			$\equiv -428.00$
SLAP2		-55.50			-427.5
GISP (Greenland Ice Sheet Precipitation)	water	-24.76			-189.5
IAEA 604	Enriched H ₂ O	-5.86			799.9
NGS1	CH ₄ in nat. gas			-29.0	-138
NGS2	CH ₄ in nat. gas			-44.7	-173
NGS2	C ₂ H ₆ in nat. gas			-31.7	-121
NGS3	CH ₄ in nat. gas			-72.7	-176
NBS-18	calcite	7.20	-23.00	-5.01	
NBS-19	calcite	28.64	$\equiv -2.20$	$\equiv +1.95$	
IAEA-603	calcite		-2.37	2.46	
IAEA-CO-1	calcite	28.39	-2.44	2.48	
IAEA-CO-8	calcite	7.54	-22.67	-5.75	
IAEA-CO-9	BaCO ₃	15.16	-15.28	-47.12	
LSVEC	Li ₂ CO ₃	3.63	-26.46	-46.48	
USGS-24	graphite			-15.99	
NBS-22	oil			-29.74	
IAEA-CH-7	polyethylene			-31.83	-100.3
IAEA-C-6	sucrose			-10.43	
NBS-28	quartz	9.58			
NBS-30	biotite	5.24			-65.7
NIST RM 8562	CO ₂	22.20	-8.45	-3.76	
NIST RM 8563	CO ₂	6.46	-23.72	-41.56	
NIST RM 8564	CO ₂	31.11	0.19	-10.45	

Appendix 1, continued.

		$\delta^{18}\text{O}$ (SMOW)	$\delta^{13}\text{C}$ (VPDB)	$\delta^{15}\text{N}$ (air)	δD (VSMOW)
USGS-24	graphite		-15.99		
NBS-22	oil		-29.74		
IAEA 600	caffeine		-27.77	1.0	
IAEA 601	benzoic acid	23.3			
IAEA 602	benzoic acid	71.4			
IAEA-CH-3	cellulose		-24.724		
IAEA-CH-6	sucrose		-10.449		
IAEA-CH-7	polyethylene		-32.151		-100.3
IAEA-303-A	NaHCO ₃		93.3		
IAEA-303-B	NaHCO ₃		466.		
IAEA-N-1	(NH ₄) ₂ SO ₄			0.4	
IAEA-N-2	(NH ₄) ₂ SO ₄			20.3	
IAEA-NO-3	KNO ₃	25.6		4.7	
NSVEC	N ₂ gas			-2.8	
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-305A	(NH ₄) ₂ SO ₄			39.8	
IAEA-305B	(NH ₄) ₂ SO ₄			375.3	
IAEA-311	(NH ₄) ₂ SO ₄			4693	
USGS25	(NH ₄) ₂ SO ₄			-30.4	
USGS26	(NH ₄) ₂ SO ₄			53.7	
IAEA-310A	CO(NH ₂) ₂			47.2	
IAEA-310B	CO(NH ₂) ₂			244.6	
IAEA-NO-3	KNO ₃	25.3		4.69	
USGS32	KNO ₃			179.2	
USGS34	KNO ₃	-27.9		-1.8	
USGS35	NaNO ₃	57.5		2.7	

Appendix 1, continued.

		$\delta^{18}\text{O}$ (SMOW)	$\delta^{15}\text{N}$ (air)	$\delta^{34}\text{S}$ (CDT)	$\delta^{37}\text{Cl}$ (SMOC)
USGS25	(NH ₄) ₂ SO ₄		-30.25		
USGS26	(NH ₄) ₂ SO ₄		53.62		
USGS32	KNO ₃		179.2		
USGS34	KNO ₃	-27.9	-1.8		
USGS35	NaNO ₃	57.5	2.7		
IAEA-S-1	Ag ₂ S			≡ -0.30	
IAEA-S-2	Ag ₂ S			22.67	
IAEA-S-3	Ag ₂ S			-32.55	
IAEA-S-4	native sulfur			16.9	
NBS-123	sphalerite			17.44	
NBS-127	BaSO ₄	8.7		21.1*	
IAEA-SO-5	BaSO ₄	12.0		0.49	
IAEA-SO-6	BaSO ₄	-11.0		-34.05	
Soufre de lacq	Sulfur			16.90	
SRM 975	NaCl				0.43
SRM 975a	NaCl				0.2
ISL 354	NaCl				0.05

2

*The original published $\delta^{34}\text{S}$ value of NBS 127 was 20.32‰ using SO₂ gas (Hut, 1987). A revised value of 21.1‰ was determined using SF₆ gas.

Coplen T. B., Hopple J. A., Böhlke J. K., Peiser H. S., Rieder S. E., Krouse H. R., Rosman K. J. R., Ding T., Vocke R. D. J., Révész K. M., Lamberty A., Taylor P., and DeBièvre P. (2002) Compilation of Minimum and Maximum Isotope Ratios of Selected Elements in Naturally Occurring Terrestrial Materials and Reagents, pp. 98. United States Geological Survey.

Hut G. (1987) Consultants' group meeting on stable isotope reference samples for geochemical and hydrological investigations. International Atomic Energy Agency.