

Table VII-2. Types of concentration profiles and major chemical speciations of the elements in the ocean.

Z	Type ^a	Speciation ^b	Z	Type ^a	Speciation ^b
Ia			Ib		
Li-3	c	Li ⁺	Cu-29	n	CuCO ₃ ^o , Cu-org.
Na-11	c	Na ⁺	Ag-47	n	AgCl ₂ ⁻
K-19	c	K ⁺	Au-79	pc	AuOH(H ₂ O) ^o
Rb-37	c	Rb ⁺	IIb		
Cs-55	c	Cs ⁺	Zn-30	n	Zn ⁺² , ZnCl ⁺
Fr-87	(c)	Fr ⁺	Cd-48	n	CdCl ₂ ^o
IIa			Hg-80	m	HgCl ₄ ⁻²
Be-4	n	BeOH ⁺ , Be(OH) ₂ ^o	IIIa		
Mg-12	c	Mg ⁺²	B-5	c	B(OH) ₃ ^o , polymer?
Ca-20	c	Ca ⁺²	Al-13	s	Al(OH) ₃ ^o , Al(OH) ₄ ⁻
Sr-38	c	Sr ⁺²	Ga-31	m	Ga(OH) ₄ ⁻
Ba-56	n	Ba ⁺²	In-49	s	In(OH) ₃ ^o
Ra-88	n	Ra ⁺²	Tl-81	pc	Tl ⁺ , TlCl ^o
IIIb			IVa		
Sc-21	m	Sc(OH) ₃ ^o	C-6	n	HCO ₃ ⁻
Y-39	(n)	YCO ₃ ⁺ , Y(CO ₃) ₂ ⁻	Si-14	n	H ₄ SiO ₄ ^o
La-57	n	LaCO ₃ ⁺ , La(CO ₃) ₂ ⁻	Ge-32	n	H ₄ GeO ₄ ^o , H ₃ GeO ₄ ⁻
Ac-89		AcCO ₃ ⁺ , Ac ⁺³	Sn-50	s	SnO(OH) ₃ ⁻
IVb			Pb-82	s	PbCO ₃ ^o , PbCl ⁺
Ti-22	m	Ti(OH) ₄ ^o	Va		
Zr-40	m	Zr(OH) ₅ ⁻	N-7	n	NO ₃ ⁻
Hf-72	s	Hf(OH) ₅ ⁻	P-15	n	NaHPO ₄ ⁻ , HPO ₄ ⁻²
Vb			As-33	n	HAsO ₄ ⁻²
V-23	n	NaHVO ₄ ⁻ , HVO ₄ ⁻²	s	As(OH) ₃ ^o , As(OH) ₄ ⁻	
Nb-41	(n)	Nb(OH) ₆ ⁻ , Nb(OH) ₅ ^o	Sb-51	(n)	Sb(OH) ₆ ⁻
Ta-73	(n)	Ta(OH) ₅ ^o , Ta(OH) ₆ ⁻	Bi-83	s	Bi(OH) ₃ ^o
VIb			VIa		
Cr-24	n	CrO ₄ ⁻² , NaCrO ₄ ⁻	S-16	c	SO ₄ ⁻²
	s	Cr(OH) ₃ ^o , Cr(OH) ₂ ⁺	Se-34	n	SeO ₄ ⁻²
Mo-42	c	MoO ₄ ⁻²		n	SeO ₃ ⁻²
W-74	(n)	WO ₄ ⁻²	Te-52	s	TeO(OH) ₅ ⁻ , Te(OH) ₆ ^o
VIIb				s	TeO(OH) ₃ ⁻
Mn-25	s	Mn ⁺² , MnCl ⁺	Po-84		PoO(OH) ₃ ⁻
Tc-43	c	TcO ₄ ⁻	VIIa		
Re-75	c	ReO ₄ ⁻	F-9	c	F ⁻ , MgF ⁺
			Cl-17	c	Cl ⁻
			Br-35	c	Br ⁻
			I-53	n	IO ₃ ⁻

Z	Type ^a	Speciation ^b	Z	Type ^a	Speciation ^b
VIIIb			VIIIb		
Fe-26	m	Fe(OH) ₃ ⁰	Os-76	(n)	OsO ₄ ⁰ , reduced forms
Co-27	s	Co ⁺² , CoCl ⁺	Ir-77	(n)	Ir(OH) ₃ ⁰ , IrCl ₆ ⁻³ ?
Ni-28	n	Ni ⁺² , NiCl ⁺	Pt-78	pc	PtCl ₄ ⁻² , Pt(OH) ₂ ⁰ ?
Ru-44	(n)	RuO ₄ ⁰ , reduced forms			
Rh-45	(n)	Rh(OH) ₃ ⁰ , RhCl ₆ ⁻³ ?			
Pd-46	n	PdCl ₄ ⁻² , Pd(OH) ₂ ⁰ ?			
Lanthanides			Actinides		
La-57	n	LaCO ₃ ⁺ , La(CO ₃) ₂ ⁻	Ac-89		AcCO ₃ ⁺ , Ac ⁺³
Ce-58	s	CeCO ₃ ⁺ , Ce(CO ₃) ₂ ⁻	Th-90	s	Th(OH) ₄ ⁰
Pr-59	n	PrCO ₃ ⁺ , Pr(CO ₃) ₂ ⁻	Pa-91	(s)	PaO ₂ OH ⁰
Nd-60	n	NdCO ₃ ⁺ , Nd(CO ₃) ₂ ⁻	U-92	c	UO ₂ (CO ₃) ₂ ⁻² , UO ₂ (CO ₃) ₃ ⁻⁴
Pm-61	n	PmCO ₃ ⁺ , Pm(CO ₃) ₂ ⁻	Np-93		NpO ₂ ⁺ , NpO ₂ (CO ₃) ⁻
Sm-62	n	SmCO ₃ ⁺ , Sm(CO ₃) ₂ ⁻	Pu-94		PuO ₂ (CO ₃)(OH) ⁻
Eu-63	n	EuCO ₃ ⁺ , Eu(CO ₃) ₂ ⁻		(s)	Pu(OH) ₃ ⁺ , Pu(OH) ₄ ⁰
Gd-64	n	GdCO ₃ ⁺ , Gd(CO ₃) ₂ ⁻	Am-95		AmCO ₃ ⁺
Tb-65	n	TbCO ₃ ⁺ , Tb(CO ₃) ₂ ⁻	Cm-96		CmCO ₃ ⁺
Dy-66	n	DyCO ₃ ⁺ , Dy(CO ₃) ₂ ⁻	Bk-97		BkCO ₃ ⁺
Ho-67	n	HoCO ₃ ⁺ , Ho(CO ₃) ₂ ⁻	Cf-98		CfCO ₃ ⁺
Er-68	n	ErCO ₃ ⁺ , Er(CO ₃) ₂ ⁻			
Tm-69	n	TmCO ₃ ⁺ , Tm(CO ₃) ₂ ⁻			
Yb-70	n	YbCO ₃ ⁺ , Yb(CO ₃) ₂ ⁻			
Lu-71	n	LuCO ₃ ⁺ , Lu(CO ₃) ₂ ⁻			

^aTypes of the concentration profiles in the oceans. c = conservative, pc = pseudo conservative, n = nutrient type, s = scavenged type, m = mixed type. The types in parentheses are only educated guesses.

^bLi (1991, and references therein). The question marks are educated guesses for the speciations.