COMPOSICIÓN MINERAL DEL AGUA DE MAR

Minerales en el residuo seco del agua de mar											
Elemento	**Cantidad (ng/Kg)**	**Cantidad (ppm)**	**Porcentaje (%)**	**Elemento**	**Cantidad (ng/Kg)**	**Cantidad (ppm)**	**Porcentaje (%)**	**Elemento**	**Cantidad (ng/Kg)**	**Cantidad (ppm)**	**Porcentaje (%)**
Cloro	19.350.000.000	19350	58,21	Cromo	212,00	0,000212	0,0000006377	Iterbio	1,20	0,0000012	0,00000000361
Sodio	10.780.000.000	10780	32,43	Antimonio	200,00	0,000200	0,0000006016	Disprosio	1,10	0,0000011	0,00000000331
Magnesio	1.280.000.000	1280	3,85	Neón	160,00	0,000160	0,0000004813	Gadolinio	0,900	0,00000090	0,000000002707
Azufre	898.000.000	898	2,70	Selenio	155,00	0,000155	0,0000004663	Escandio	0,700	0,00000070	0,000000002106
Calcio	412.000.000	412	1,24	Cobre	150,00	0,000150	0,0000004512	Cerio	0,700	0,00000070	0,000000002106
Potasio	399.000.000	399	1,20	Cadmio	70,00	0,000070	0,0000002106	Praseodimio	0,700	0,00000070	0,000000002106
Bromo	67.000.000	67	0,20	Xenón	66,00	0,000066	0,0000001985	Samario	0,570	0,00000057	0,000000001715
Carbono	27.000.000	27	0,081	Aluminio	30,00	0,000030	0,0000000902	Estaño	0,500	0,00000050	0,000000001504
Nitrógeno	8.720.000	8,72	0,026232	Hierro	30,00	0,000030	0,0000000902	Holmio	0,360	0,00000036	0,000000001083
Estroncio	7.800.000	7,80	0,023464	Manganeso	20,00	0,000020	0,0000000602	Lutecio	0,230	0,00000023	0,000000000692
Boro	4.500.000	4,50	0,013537	Itrio	17,00	0,000017	0,0000000511	Berilio	0,210	0,00000021	0,000000000632
Oxígeno	2.800.000	2,80	0,008423	Circonio	15,00	0,000015	0,0000000451	Tulio	0,200	0,00000020	0,000000000602
Silicio	2.800.000	2,80	0,008423	Talio	13,00	0,000013	0,0000000391	Europio	0,170	0,00000017	0,000000000511
Flúor	1.300.000	1,30	0,003911	Wolframio	10,00	0,000010	0,0000000301	Terbio	0,170	0,00000017	0,000000000511
Argón	620.000	0,62	0,001865	Renio	7,80	0,0000078	0,00000002346	Mercurio	0,140	0,00000014	0,000000000421
Litio	180.000	0,18	0,000541	Helio	7,60	0,0000076	0,00000002286	Rodio	0,080	0,000000080	0,0000000002407
Rubidio	120.000	0,12	0,000361	Titanio	6,50	0,0000065	0,00000001955	Telurio	0,070	0,000000070	0,0000000002106
Fósforo	62.000	0,062	0,0001865	Lantano	5,60	0,0000056	0,00000001685	Paladio	0,060	0,000000060	0,0000000001805
Yodo	58.004	0,058	0,0001745	Germanio	5,50	0,0000055	0,00000001655	Platino	0,050	0,000000050	0,0000000001504
Bario	15.000	0,015	0,0000451	Niobio	5,00	0,0000050	0,00000001504	Bismuto	0,030	0,000000030	0,0000000000902
Molibdeno	10.000	0,010	0,0000301	Hafnio	3,40	0,0000034	0,00000001023	Oro	0,020	0,000000020	0,0000000000602
Uranio	3.200	0,0032	0,00000963	Neodimio	3,30	0,0000033	0,00000000993	Torio	0,020	0,000000020	0,0000000000602
Vanadio	2.000	0,0020	0,00000602	Plomo	2,70	0,0000027	0,00000000812	Indio	0,010	0,000000010	0,0000000000301
Arsénico	1.205	0,0012	0,00000363	Tantalio	2,50	0,0000025	0,00000000752	Rutenio	0,0050	0,0000000050	0,00000000001504
Níquel	480	0,00048	0,000001444	Plata	2,00	0,0000020	0,00000000602	Osmio	0,0020	0,0000000020	0,00000000000602
Cinc	350	0,00035	0,000001053	Cobalto	1,20	0,0000012	0,00000000361	Iridio	0,00013	0,000000000130	0,000000000000391
Criptón	310	0,00031	0,000000933	Galio	1,20	0,0000012	0,00000000361	Radio	0,00013	0,000000000130	0,000000000000391
Cesio	306	0,000306	0,0000009205	Erbio	1,20	0,0000012	0,00000000361	**TOTAL (83)**	**33.241.994.067,30**	**33241,99407**	**100,00%**

Fuente: A Fresh Look al Element Distribution in the North Pacific. 1997. Yoshiyuki Nozaki, Ocean Research Institute, University of Tokyo, Japan.

COMPOSICIÓN MINERAL DEL AGUA DE MAR (referencias bibliográficas)

Minerales en el residuo seco del agua de mar								
Elemento	**Cantidad (ng/Kg)**	**Referencia**	**Elemento**	**Cantidad (ng/Kg)**	**Referencia**	**Elemento**	**Cantidad (ng/Kg)**	**Referencia**
Cloro (Cl)	19.350.000.000	Wilson (1975)	Cromo (Cr)	212,00	Nakayama et al. (1981)	Iterbio (Yb)	1,20	Piepgras and Jacobsen (1992)
Sodio (Na)	10.780.000.000	Millero and Leung (1976)	Antimonio (Sb)	200,00	Brewer et al. (1972)	Disprosio (Dy)	1,10	Piepgras and Jacobsen (1992)
Magnesio (Mg)	1.280.000.000	Carpenter and Manella (1973)	Neón (Ne)	160,00	Craig et al. (1967)	Gadolinio (Gd)	0,900	Piepgras and Jacobsen (1992)
Azufre (S)	898.000.000	Morris and Riley (1966)	Selenio (Se)	155,00	Measures et al. (1980)	Escandio (Sc)	0,700	Brewer et al. (1972)
Calcio (Ca)	412.000.000	Horibe et al. (1974)	Cobre (Cu)	150,00	Bruland (1980)	Cerio (Ce)	0,700	Piepgras and Jacobsen (1992
Potasio (K)	399.000.000	Culkin and Cox (1966)	Cadmio (Cd)	70,00	Bruland (1980)	Praseodimio (Pr)	0,700	Zhang et al. (1994)
Bromo (Br)	67.000.000	Morris and Riley (1966)	Xenón (Xe)	66,00	Mazor et al. (1964)	Samario (Sm)	0,570	Piepgras and Jacobsen (1992)
Carbono (C)	27.000.000	Broecker and Takahashi (1978)	Aluminio (Al)	30,00	Orians and Bruland (1985)	Estaño (Sn)	0,500	Byrd and Andreae (1982
Nitrógeno (N)	8.720.000	Craig et al. (1967)	Hierro (Fe)	30,00	Martin et al. (1989)	Holmio (Ho)	0,360	Zhang et al. (1994)
Estroncio (Sr)	7.800.000	Brass and Turekian (1974)	Manganeso (Mn)	20,00	Landing and Bruland (1980)	Lutecio (Lu)	0,230	Piepgras and Jacobsen (1992)
Boro (B)	4.500.000	Noakes and Hood (1961)	Itrio (Y)	17,00	Zhang et al. (1994)	Berilio (Be)	0,210	Measures and Edmond (1982)
Oxígeno (O)	2.800.000	GEOSECS Operation Group (1987)	Circonio (Zr)	15,00	McKelvey and Orians (1993)	Tulio (Tm)	0,200	Zhang et al. (1994)
Silicio (Si)	2.800.000	GEOSECS Operation Group (1987)	Talio (Tl)	13,00	Flegal and Patterson (1985)	Europio (Eu)	0,170	Piepgras and Jacobsen (1992)
Flúor (F)	1.300.000	Bewers et al. (1973)	Wolframio (W)	10,00	Sohrin et al. (1987)	Terbio (Tb)	0,170	Zhang et al. (1994)
Argón (Ar)	620.000	Craig et al. (1967)	Renio (Re)	7,80	Anbar et al. (1992)	Mercurio (Hg)	0,140	Gill and Bruland (1987)
Litio (Li)	180.000	Stoffyn-Egli and Mackenzie (1984)	Helio (He)	7,60	Clarke et al. (1970)	Rodio (Rh)	0,080	Bertine et al. (1993)
Rubidio (Rb)	120.000	Spencer et al. (1970)	Titanio (Ti)	6,50	Orians et al. (1990)	Telurio (Te)	0,070	Lee and Edmond (1985)
Fósforo (P)	62.000	GEOSECS Operation Group (1987)	Lantano (La)	5,60	Piepgras and Jacobsen (1992)	Paladio (Pd)	0,060	Lee (1983)
Yodo (I)	58.004	Nakayama et al. (1989)	Germanio (Ge)	5,50	Froelich and Andreae (1981)	Platino (Pt)	0,050	Colodner et al. (1993)
Bario (Ba)	15.000	Chan et al. (1977)	Niobio (Nb)	5,00	Carlisle and Hummerstone (1958)	Bismuto (Bi)	0,030	Lee et al. (1985)
Molibdeno (Mo)	10.000	Morris (1975)	Hafnio (Hf)	3,40	Boswell and Elderfield (1988)	Oro (Au)	0,020	Falkner and Edmond (1990)
Uranio (U)	3.200	Chen et al. (1986)	Neodimio (Nd)	3,30	Piepgras and Jacobsen (1992)	Torio (Th)	0,020	Roy-Barman et al. (1996)
Vanadio (V)	2.000	Collier (1984)	Plomo (Pb)	2,70	Schaule and Patterson (1981)	Indio (In)	0,010	Amakawa et al. (1996)
Arsénico (As)	1.205	Andreae (1979)	Tantalio (Ta)	2,50	Schutz and Turekian (1965)	Rutenio (Ru)	0,0050	Koide et al. (1986)
Níquel (Ni)	480	Bruland (1980)	Plata (Ag)	2,00	Martin et al. (1983)	Osmio (Os)	0,0020	Koide et al. (1996)
Cinc (Zn)	350	Bruland (1980)	Cobalto (Co)	1,20	Martin et al. (1989)	Iridio (Ir)	0,00013	Anbar et al. (1996)
Criptón (Kr)	310	Bieri et al. (1968)	Galio (Ga)	1,20	Orians and Bruland (1988)	Radio (Ra)	0,00013	Chung and Craig (1980)
Cesio (Cs)	306	Spencer et al. (1970)	Erbio (Er)	1,20	Piepgras and Jacobsen (1992)			

Fuente: A Fresh Look al Element Distribution in the North Pacific. 1997. Yoshiyuki Nozaki, Ocean Research Institute, University of Tokyo, Japan.

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