

SUPPORTING INFORMATION

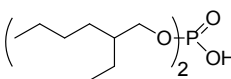
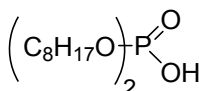
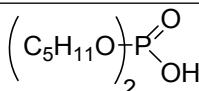
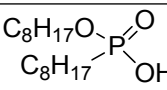
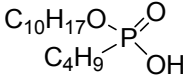
Effects of structural changes of new organophosphorus cationic exchangers on solvent extraction of cobalt, nickel and manganese from acidic chloride media

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No	Extractant	Structure	pKa (in pur water)	T, °C	Ref.
1	Bis(2-ethylhexyl)phosphoric acid		2.75	NC	1
			2.79	25	2
2	Dioctylphosphoric acid		1.48	20	3
			2.04 calculated	-	4
3	Di-n-pentylphosphoric acid		0.93	25	3
			1.89	NC	4
4	Octylphosphonic acid octyl ester		2.75	20-25	4
5	Butylphosphonic acid decyl ester		2.77	20-25	4

¹ Yao Binghua et al., "SOLVENT EXTRACTION OF METAL IONS AND SEPARATION OF NICKEL(II) FROM OTHER METAL IONS BY ORGANOPHOSPHORUS ACIDS," *Solvent Extraction and Ion Exchange* 14, no. 5 (August 1996): 849–70, doi:10.1080/07366299608918372.

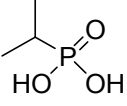
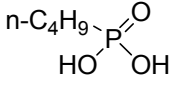
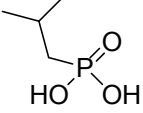
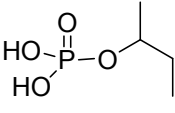
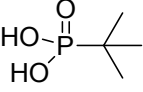
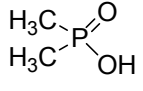
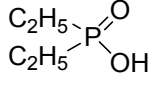
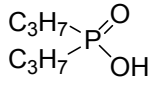
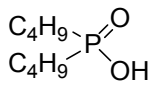
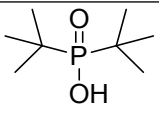
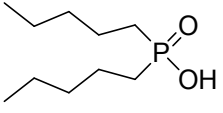
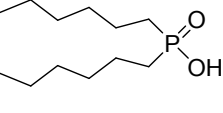
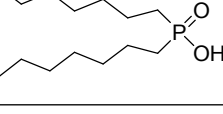
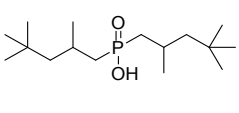
² Xun Fu et al., "EXTRACTION OF SODIUM IN BIS (2, 4, 4 - TRIMETHYLPENTYL) PHOSPHINIC ACID 'CYANEX 272'™ BASIC CONSTANTS AND EXTRACTION EQUILIBRIA," *Solvent Extraction and Ion Exchange* 8, no. 4–5 (June 1990): 573–95, doi:10.1080/07366299008918018.

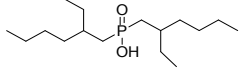
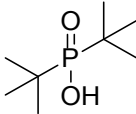
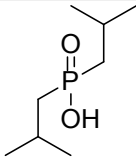
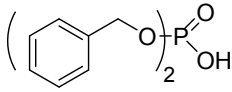
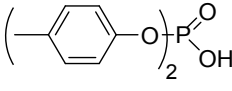
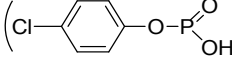
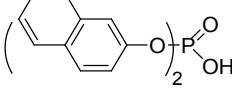
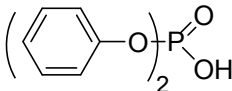
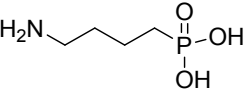
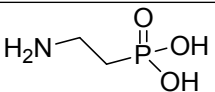
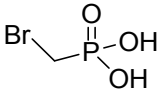
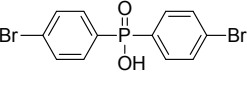
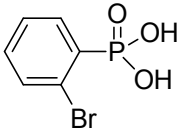
³ "kolarik1982.pdf," n.d.

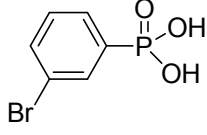
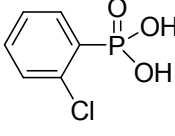
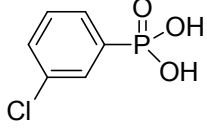
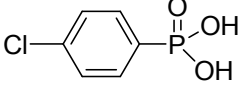
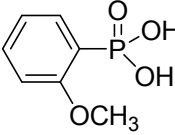
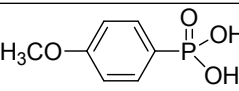
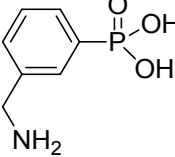
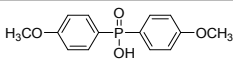
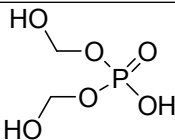
⁴ "Modelisation Apostolyk.pdf," n.d.

6	Dimethylphosphoric acid	$(\text{CH}_3\text{O})_2\text{P}(=\text{O})\text{OH}$	1.25	20-25	4
7	Diethylphosphoric acid	$(\text{C}_2\text{H}_5\text{O})_2\text{P}(=\text{O})\text{OH}$	1.39	20-25	4
8	Dipropylphosphoric acid	$(\text{C}_3\text{H}_7\text{O})_2\text{P}(=\text{O})\text{OH}$	1.55	20-25	4
9	Dibutylphosphoric acid	$(\text{C}_4\text{H}_9\text{O})_2\text{P}(=\text{O})\text{OH}$	1.74	20-25	4
10	Dihexylphosphoric acid	$(\text{C}_6\text{H}_{13}\text{O})_2\text{P}(=\text{O})\text{OH}$	1.96	20-25	4
11	Pentylheptylphosphoric acid	$\text{C}_7\text{H}_{15}\text{O}-\text{P}(=\text{O})(\text{OH})-\text{C}_5\text{H}_{11}\text{O}$	1.95	20-25	4
12	Butyloctylphosphoric acid	$\text{C}_4\text{H}_9\text{O}-\text{P}(=\text{O})(\text{OH})-\text{C}_8\text{H}_{17}\text{O}$	1.89	20-25	4
13	Nonylphosphonic acid hexyl ester	$\text{C}_6\text{H}_{13}\text{O}-\text{P}(=\text{O})(\text{OH})-\text{C}_9\text{H}_{19}$	2.76	20-25	4
14	2-Ethylhexylphosphonic acid mono-2-ethylhexyl ester PC88A		3.30/ 3.42	25	1
			3.30	25	2
15	<i>t</i> -amylphosphonic acid		2.88	25	5
16	Neopentylphosphonic acid		2.84	25	5
17	Methylphosphonic acid	$\text{H}_3\text{C}-\text{P}(=\text{O})(\text{OH})_2$	2.38	25	5
18	Ethylphosphonic acid	$\text{C}_2\text{H}_5-\text{P}(=\text{O})(\text{OH})_2$	2.43	25	5
19	<i>n</i> -propylphosphonic acid	$n\text{-C}_3\text{H}_7-\text{P}(=\text{O})(\text{OH})_2$	2.49	25	5

⁵ Peter C. Crofts and Gennady M. Kosolapoff, "Preparation and Determination of Apparent Dissociation Constants of Some Alkylphosphonic and Dialkylphosphinic Acids¹," *Journal of the American Chemical Society* 75, no. 14 (1953): 3379–3383.

20	Isopropylphosphonic acid		2.66	25	5
21	<i>n</i> -butylphosphonic acid		2.59	25	5
22	<i>iso</i> -butylphosphonic acid		2.70	25	5
23	<i>s</i> -butylphosphonic acid		2.74	25	5
24	<i>tert</i> -butylphosphonic acid		2.79	25	5
25	Dimethylphosphinic acid		3.08	25	5
26	Diethylphosphinic acid		3.29/ 3.10	25	5
27	Dipropylphosphinic acid		3.46/ 3.26	25	5
28	Dibutylphosphinic acid		3.41/ 3.30	25	5
			3.39/3. 30	20	3,5
29	Di- <i>tert</i> -butylphosphinic acid		4.24	25	4,5
30	Dipentylphosphinic acid		3.52	20- 25	3,4
31	Di- <i>n</i> -hexylphosphinic acid		3.55	20- 25	3,4
32	Di- <i>n</i> -octylphosphinic acid		3.62	NC	4,3
33	Bis(2,4,4-trimethylpentyl)phosphinic acid Cyanex 272		3.73	25	1

34	Bis(2-ethylhexyl)phosphinic acid, PIA-8		4.48	25	1
35	Di- <i>iso</i> -propylphosphinic acid		3.56	25	5
36	Di- <i>tert</i> -butylphosphinic acid		4.24	25	5
37	Dibenzylphosphoric acid		0.60	25	3
38	Di p-cresylphosphoric acid		0.34	20	3
39	Di p-chlorophenylphosphoric acid		0.20	20	3
40	Di β-naphtylphosphoric acid		0.74	20	3
41	Diphenylphosphoric acid		0.26	20	3
			0.82 water	NC	3
42	4-Aminobutylphosphonic acid		2.55	25	Lange's Handbook of Chemistry
43	2-Aminoethylphosphonic acid		2.45 (+1)	25	Lange's Handbook of Chemistry
44	Bromomethylphosphonic acid		1.14	25	Lange's Handbook of Chemistry
45	4-Bromophenylphosphinic acid		2.1	25	Lange's Handbook of Chemistry
46	2-Bromophenylphosphonic acid		1.64	25	Lange's Handbook of Chemistry

47	3-Bromophenylphosphonic acid		1.45	25	Lange's Handbook of Chemistry
48	2-chlorophenylphosphonic acid		1.63	25	Lange's Handbook of Chemistry
49	3-chlorophenylphosphonic acid		1.55	25	Lange's Handbook of Chemistry
50	4-chlorophenylphosphonic acid		1.66	25	Lange's Handbook of Chemistry
51	(2-methoxyphenyl)phosphonic acid		2.16	25	Lange's Handbook of Chemistry, McGraw-Hill Handbook, 15eme ed.
52	(4-methoxyphenyl)phosphonic acid		2.4	17	Lange's Handbook of Chemistry
53	(3-methylamino)phenylphosphonic acid		1.1(+1)	25	Lange's Handbook of Chemistry
54	(4-methoxyphenyl)phosphinic acid		2.35	17	Lange's Handbook of Chemistry
55	Hydroxymethylphosphoric acid		1.91	25	Lange's Handbook of Chemistry