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**CONTRIBUIÇÃO AO PROJETO DE
SISTEMAS DE CONTENÇÃO DE RESÍDUOS PERIGOSOS
UTILIZANDO SOLOS LATERÍTICOS**

ANEXOS

**Tese apresentada à Escola Politécnica da
Universidade de São Paulo para obtenção do
título de Doutor em Engenharia.**

SUMÁRIO

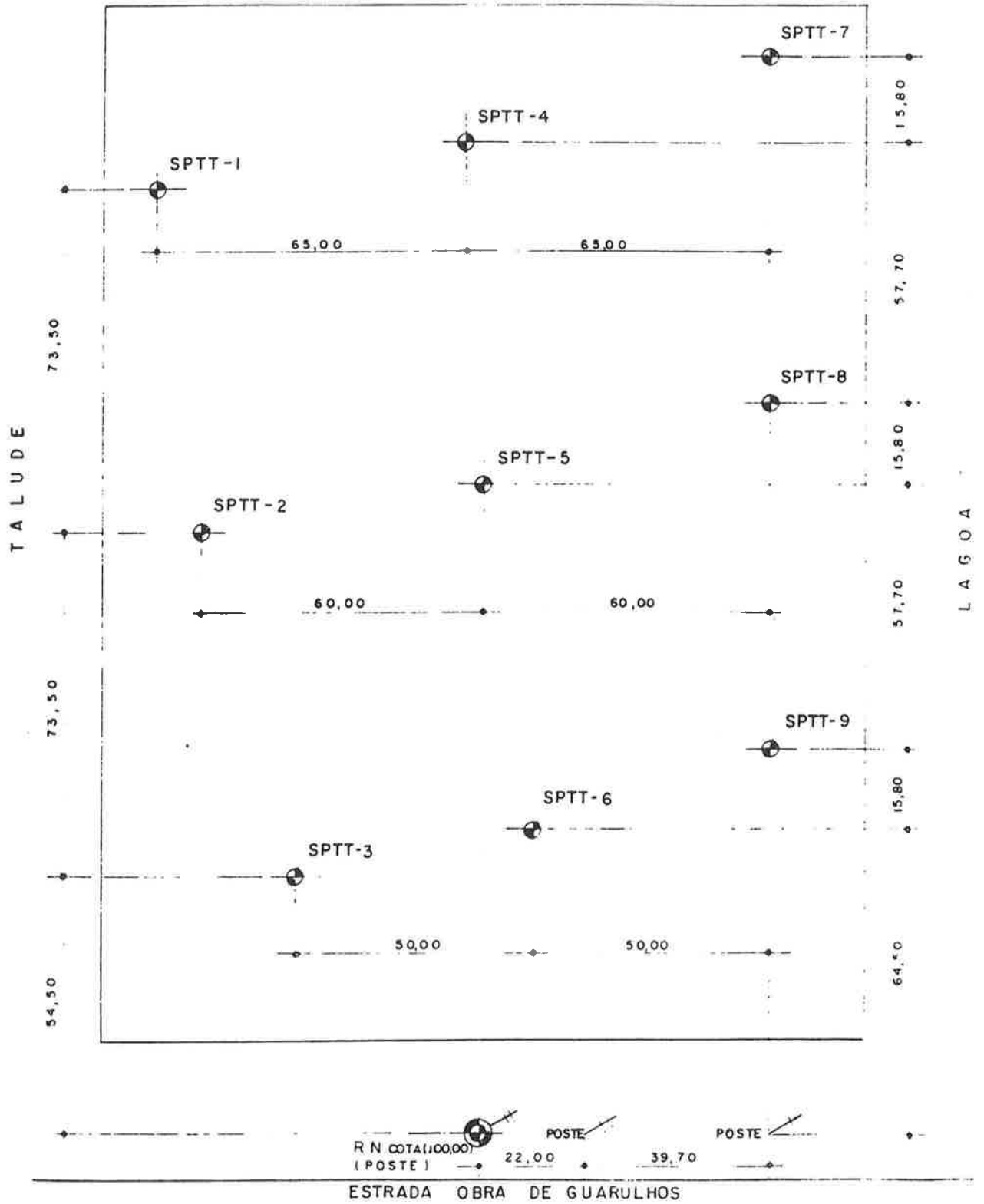
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ANEXO A

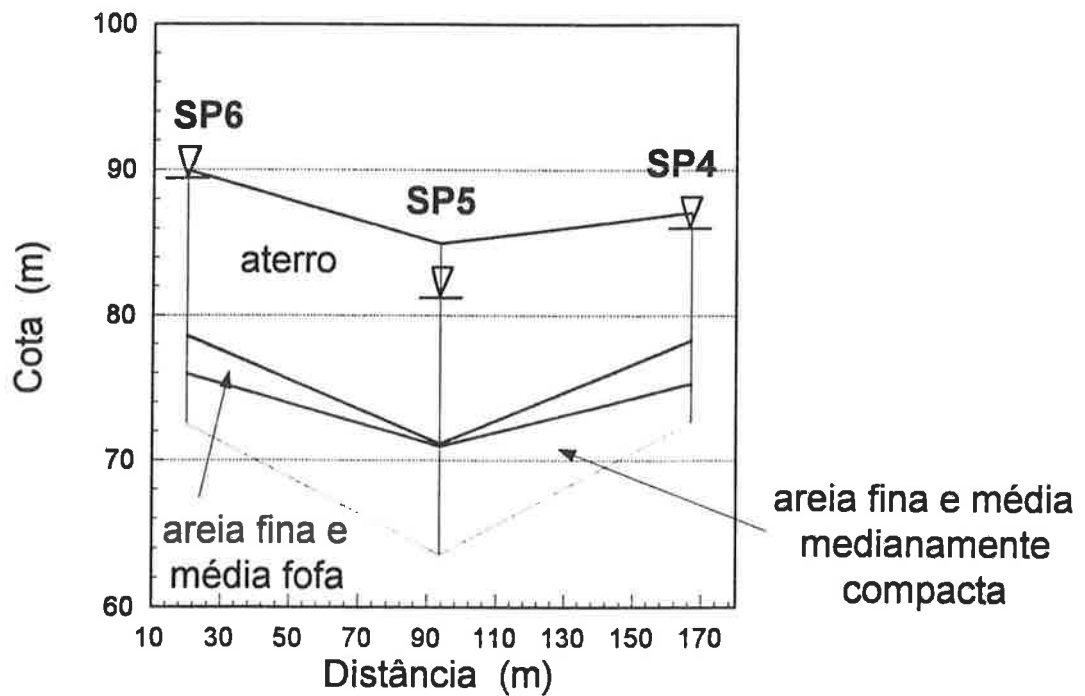
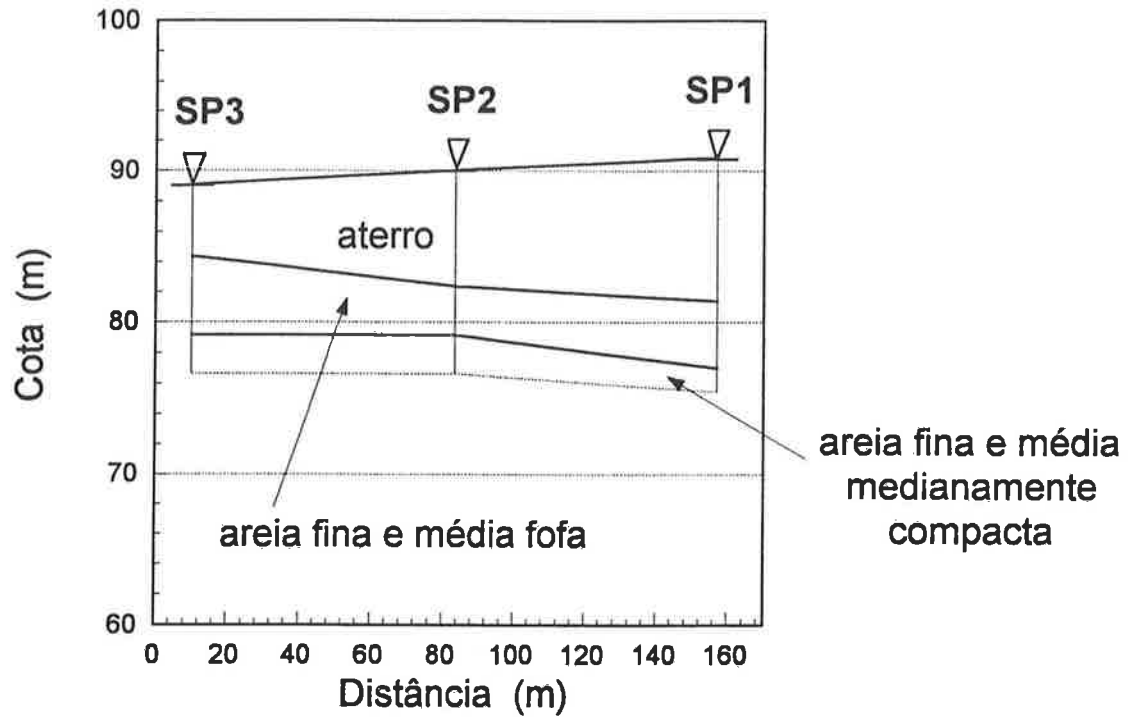
**RESULTADOS DAS SONDAGENS
EM ANTIGO PORTO DE AREIA DE CUMBICA, GUARULHOS**

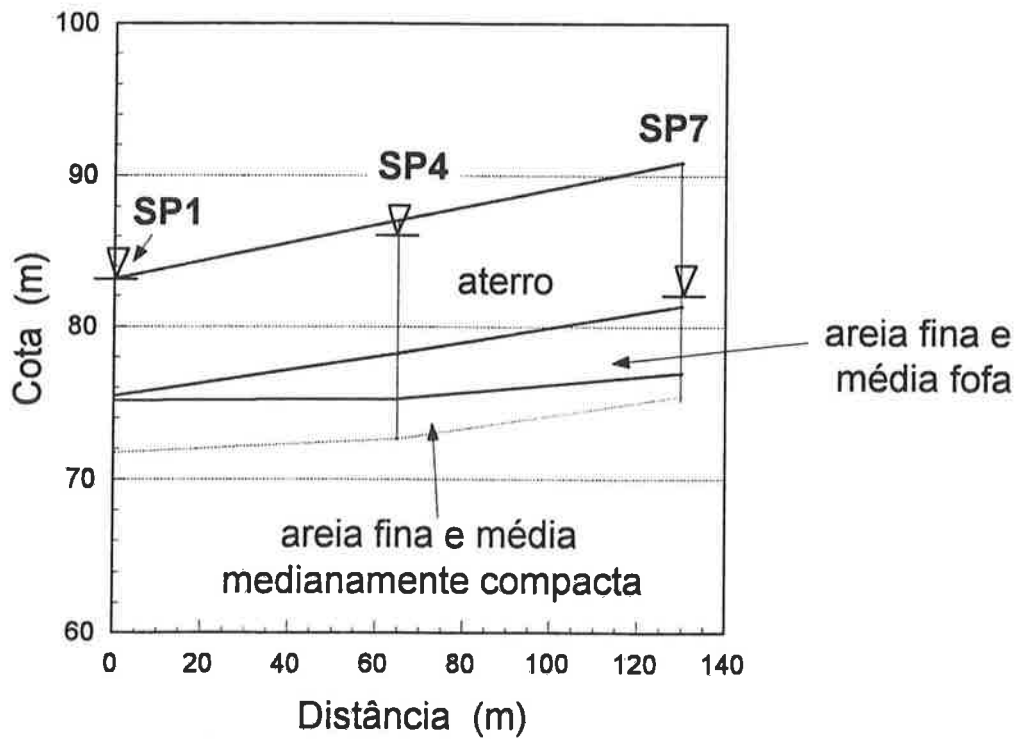
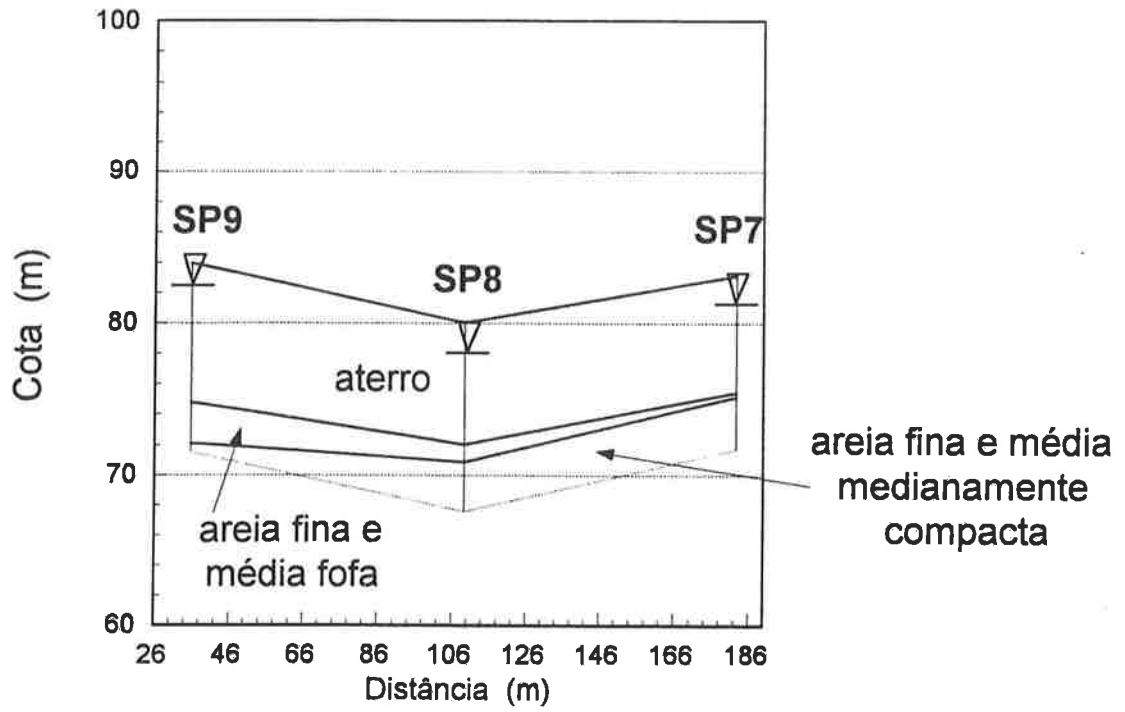
A.1) Locação das sondagens em planta

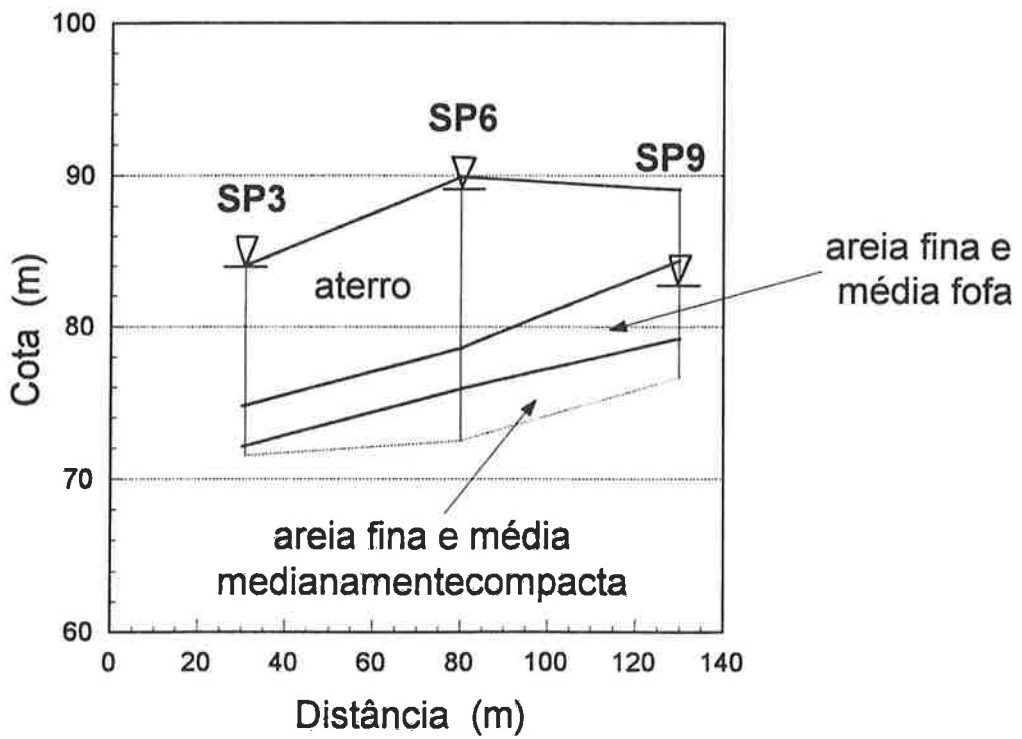
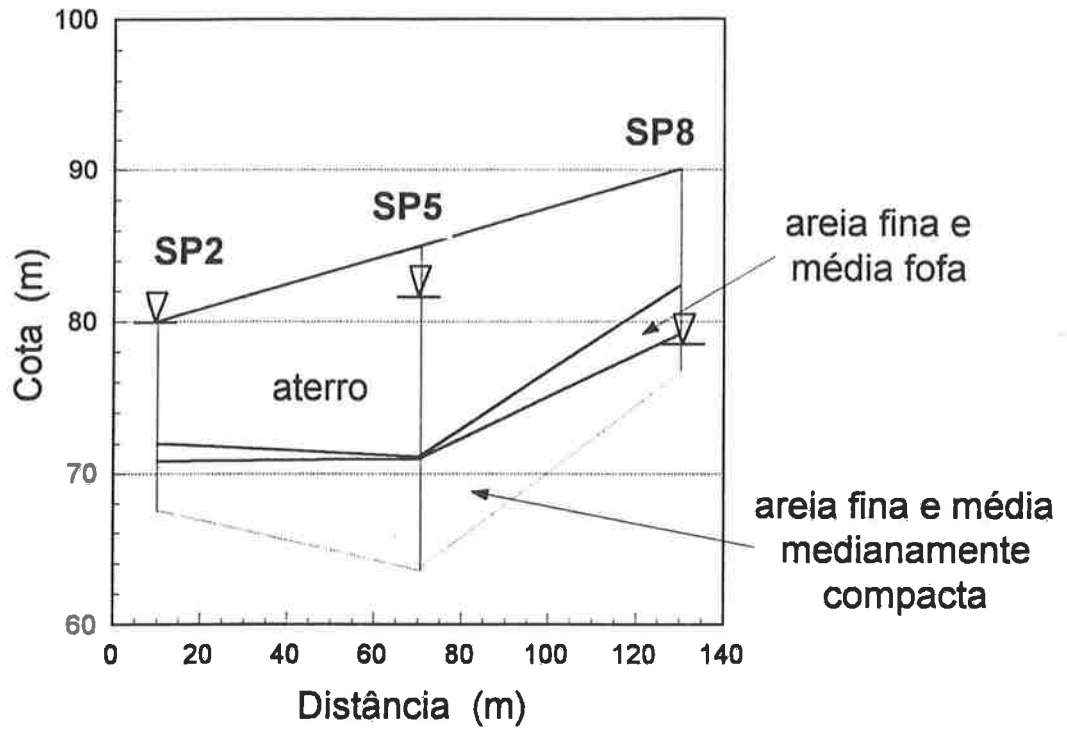
RIO DE ESGOTO



A.2) Perfis do subsolo esquematizados a partir das sondagens



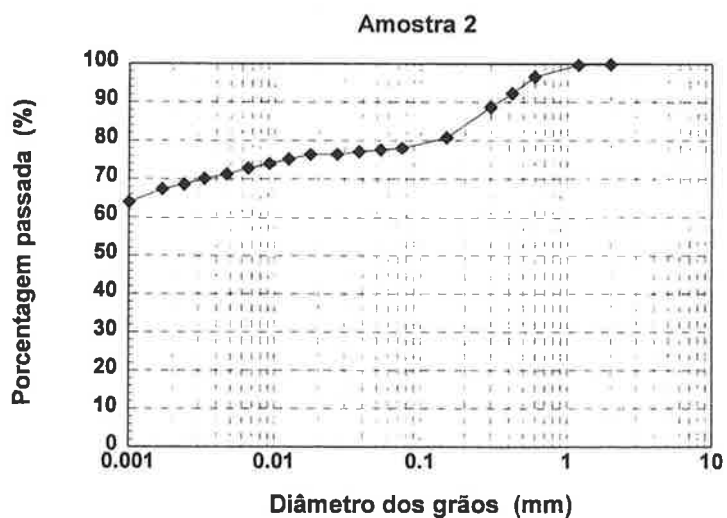
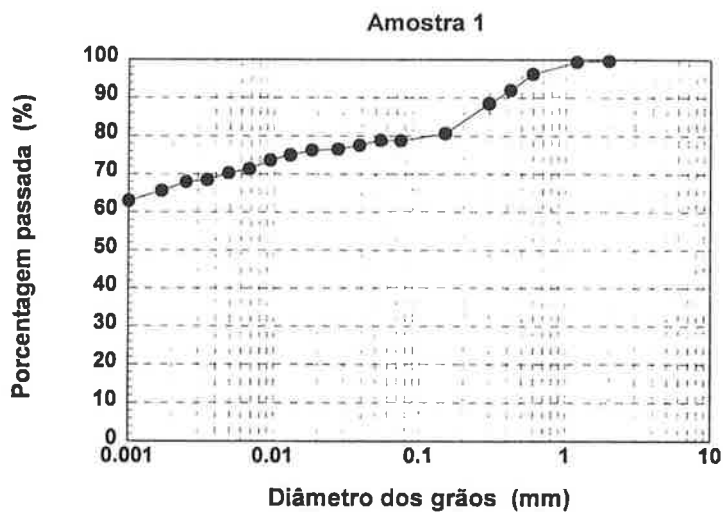




ANEXO B

ENSAIOS DE CARACTERIZAÇÃO DAS DUAS AMOSTRAS DE SOLO

C.1) Curvas granulométricas das amostras 1 e 2



C.2) Limites de consistência das amostras 1 e 2

Limites de consistência	Amostra 1	Amostra 2
LL (%)	52,2	53,2
LP (%)	33,8	31,2
IP (%)	18,5	22,0

ANEXO C

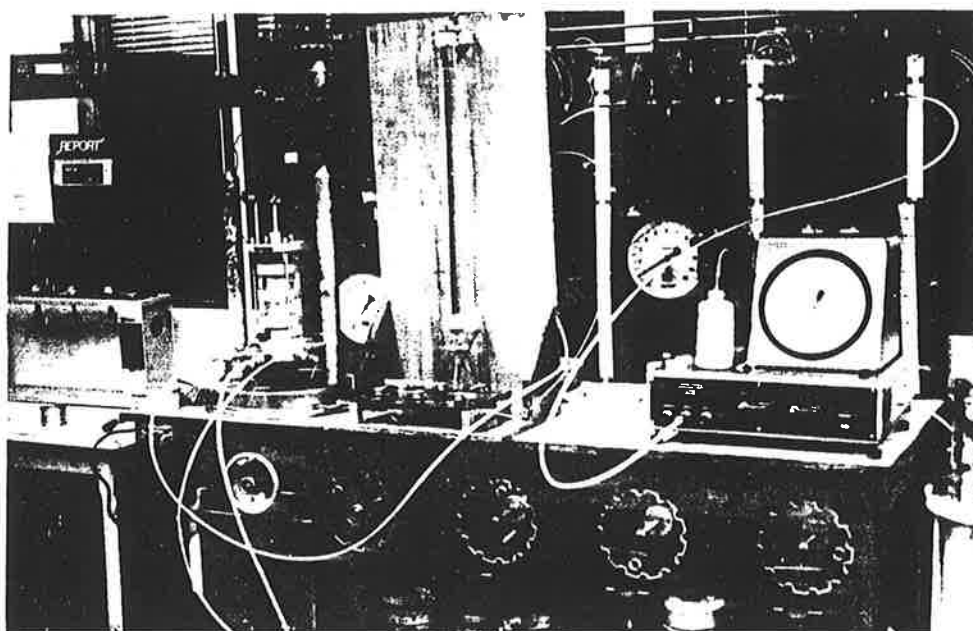
MONTAGEM DOS ENSAIOS DE
PERMEABILIDADE COM CONTRAPRESSÃO

Figura C.1 - Vista geral da montagem do ensaio

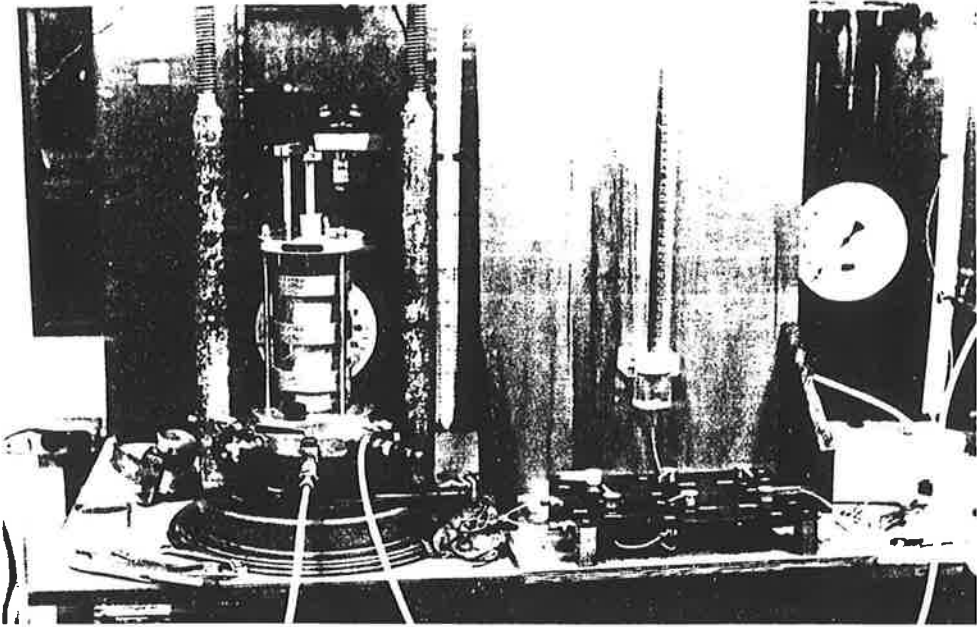


Figura C.2 - Detalhe do sistema de medição de volume percolado

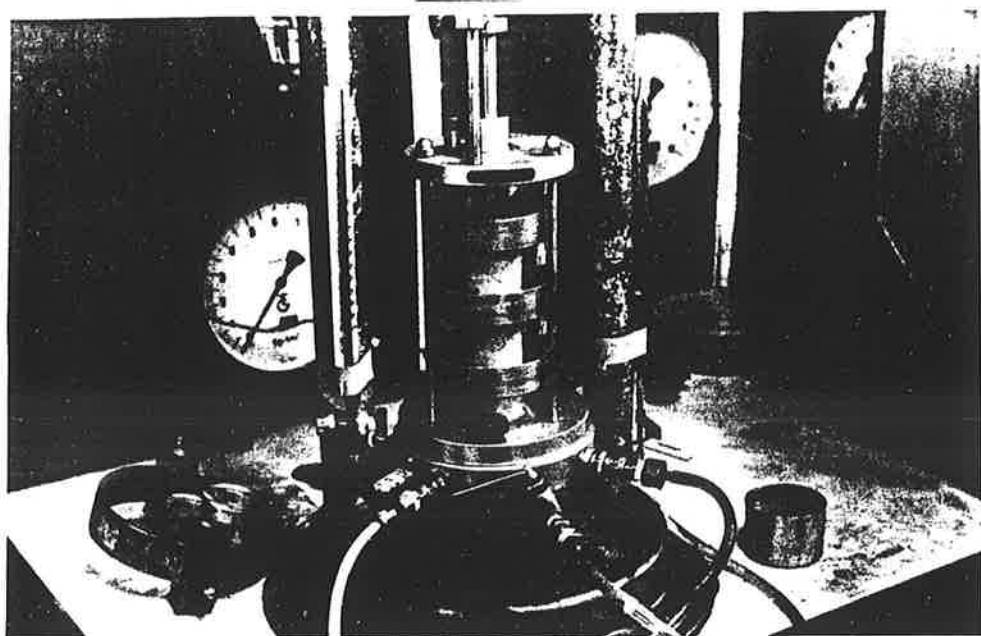


Figura C.3 - Detalhe da câmara triaxial

ANEXO D**ENSAIO DE SEDIMENTAÇÃO DO SOLO ESTUDADO
SEM DEFLOCULANTE**

As Figuras D.1, D.2 e D.3 mostram a seqüência no tempo de um ensaio de sedimentação realizado com o solo estudado sem a utilização de defloculante, evidenciando a floculação do solo.

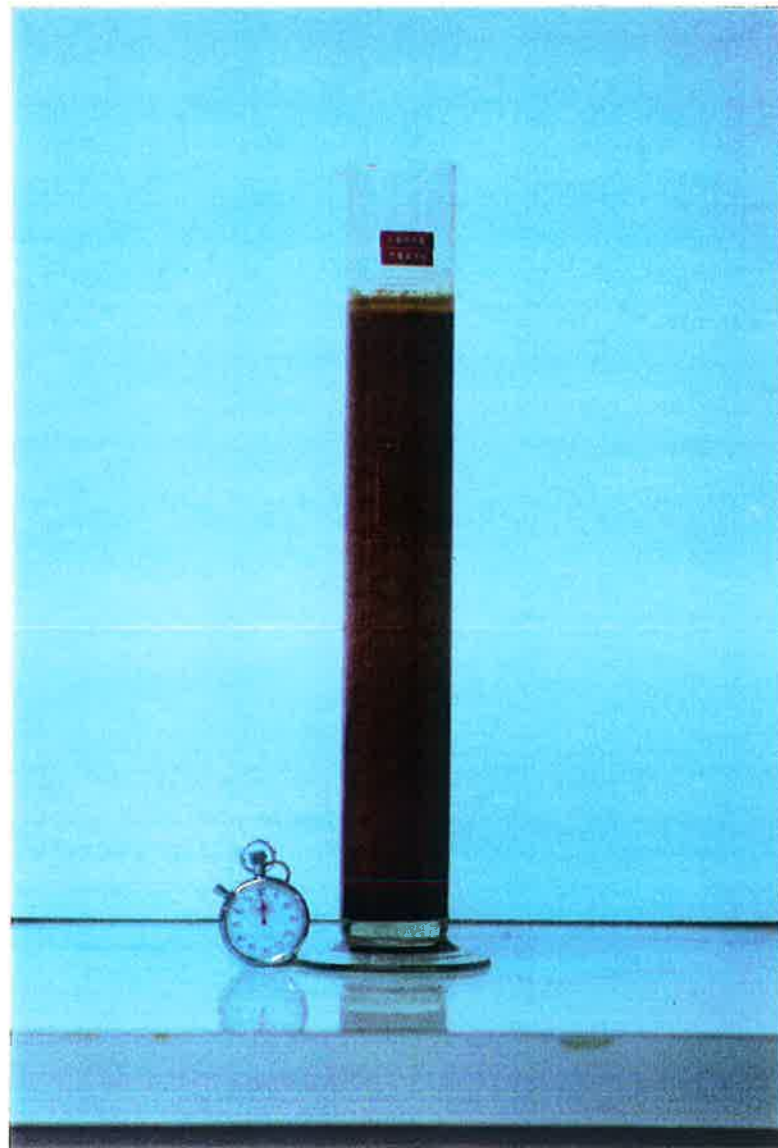


Figura D.1

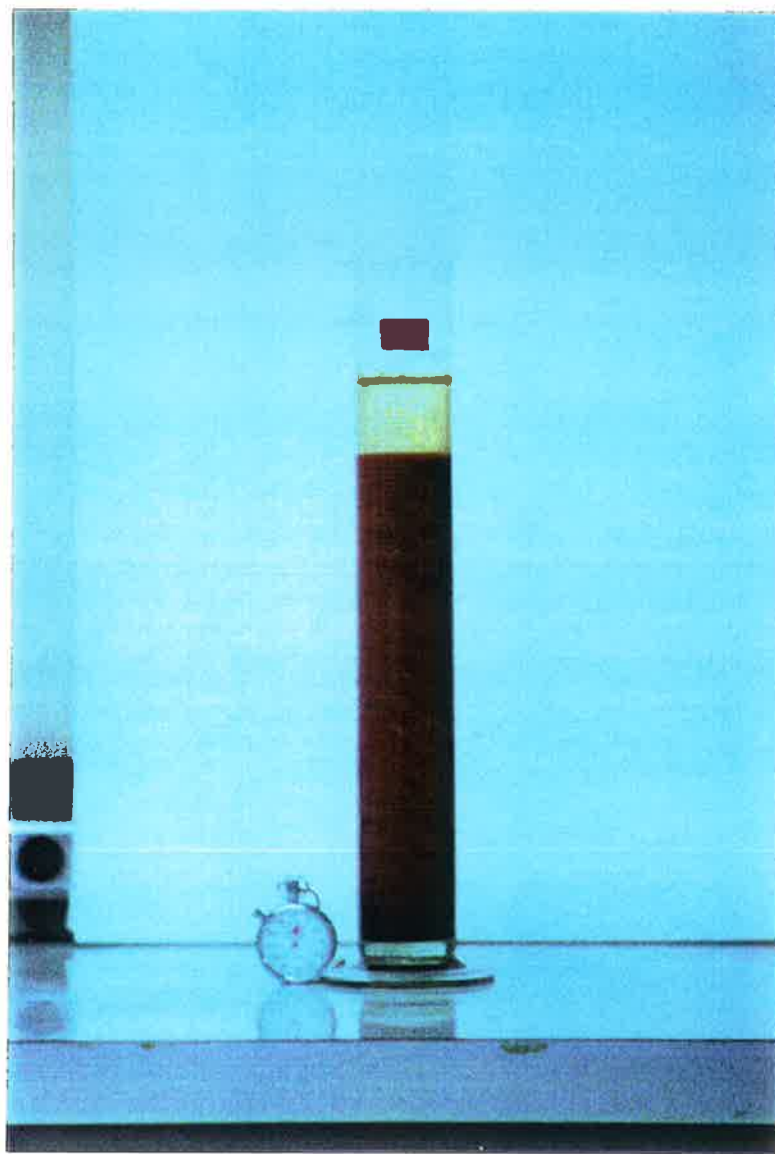


Figura D.2

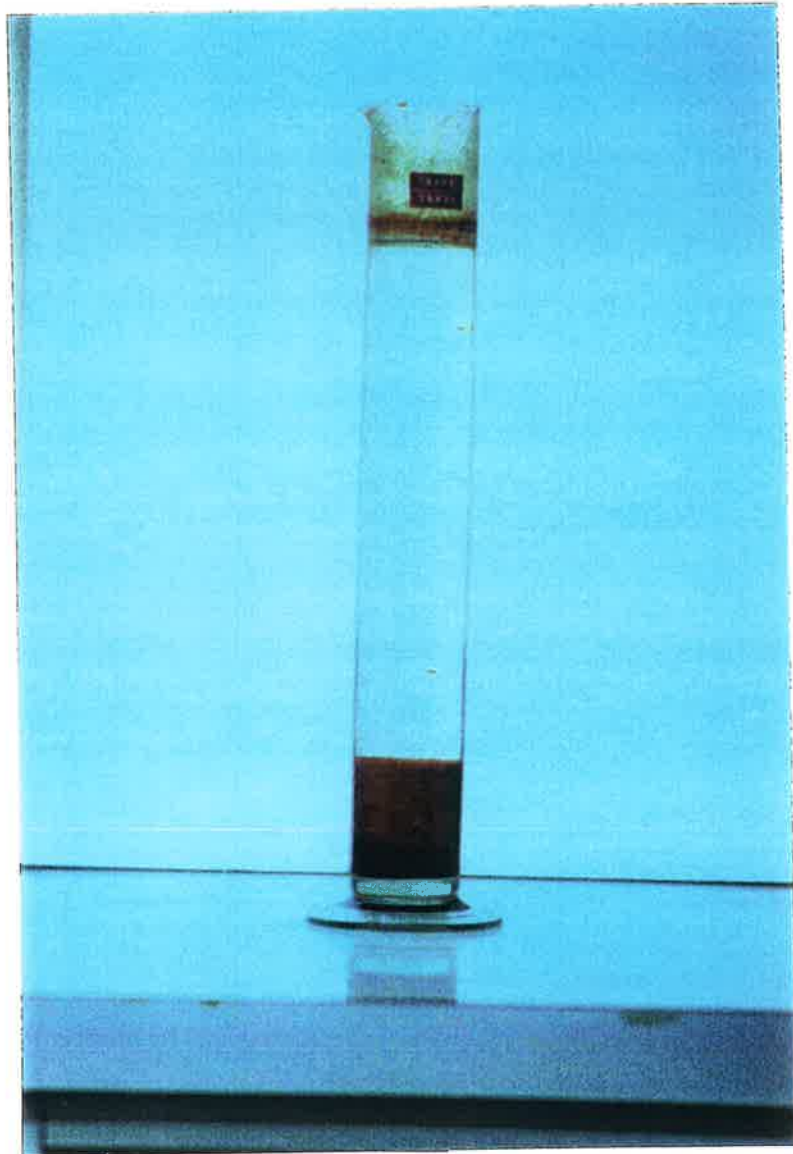


Figura D.3

ANEXO E

DADOS DE MOLDAGEM DOS CORPOS-DE-PROVA DOS ENSAIOS DE PERMEABILIDADE

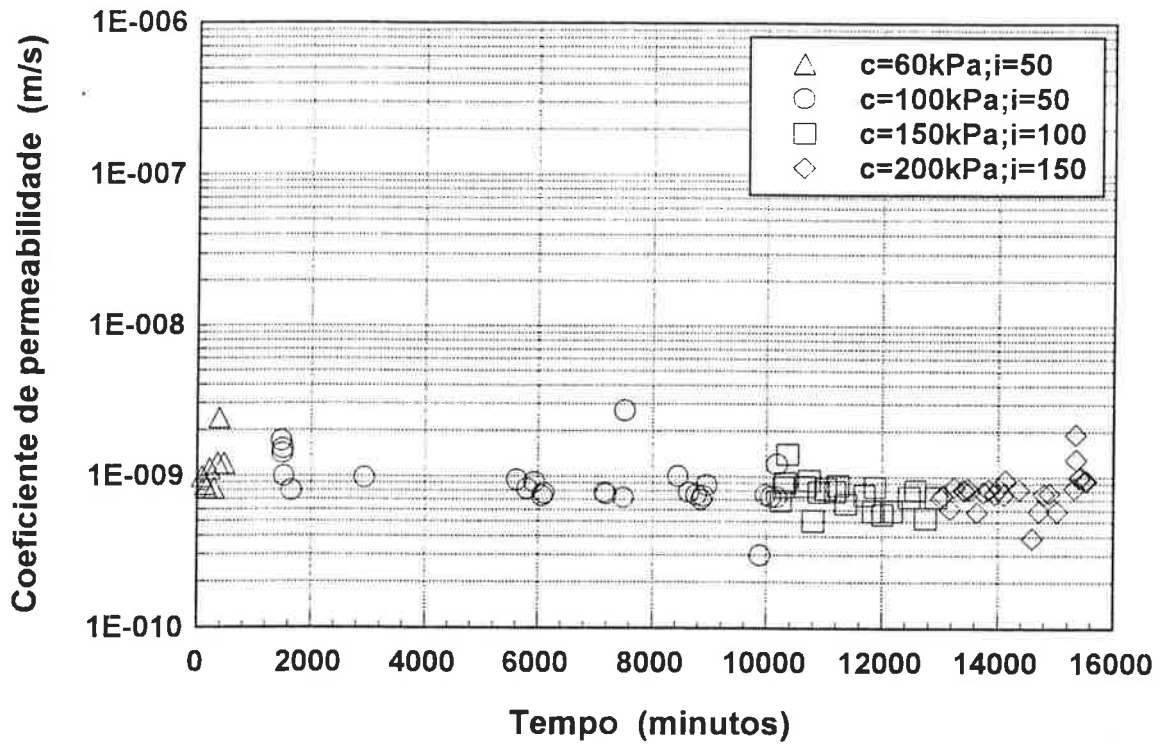
Corpo-de-prova	γ_s (kN/m ³)	h (%)	GC (%)	Δh (%)	e_i	e_f	s_i (%)	s_f (%)	Tempo de fluxo (minutos)	Tempo de ensaio (dias)	Volume percolado (volume de vazios)
1	15,14	25,3	103,3	-1,2	0,78		87,6		15532	29	1,4
2	14,26	25,9	97,3	-0,6	0,89		78,6		7520	23	77,5
3	14,64	27,7	99,9	1,2	0,84	0,82	89,0	96,6	8562	35	3,1
4	13,81	28,4	94,3	1,9	0,95	0,95	80,6	90,2	4095	17	17,3
5	14,38	27,7	98,2	1,2	0,87	0,86	85,7	91,4	4211	16	1,0
6	14,52	27,7	99,1	1,2	0,85	0,85	87,5	93,1	4422	16	0,6
7	13,94	26,5	95,2	0,0	0,93		76,6		2922	15	29,6
8	14,18	26,5	96,8	0,0	0,90		79,4		3537	15	3,1
9	14,44	26,5	98,6	0,0	0,86	0,82	84,7	96,6	3218	15	8,5
10	14,61	27,0	99,7	0,5	0,84	0,84	86,3	96,6	3912	19	2,0
11	13,85	26,7	94,5	0,2	0,94	0,94	76,3	98,7	1679	36	48,3
12	13,92	28,3	95,0	1,8	0,93	0,93	81,6	97,6	3499	18	14,2
13	14,89	24,7	101,6	-1,8	0,81	0,82	82,4	94,2	12135	62	0,6
14	13,84	28,9	94,5	2,4	0,94	0,90	82,4	90,9	9490	62	10,1
15	14,55	26,5	99,3	0,0	0,85	0,81	84,0	95,1	9257	62	8,3
16	13,98	24,0	95,4	-2,5	0,92	0,90	71,2	99,7	2208	5	9,4
17	13,93	27,8	95,1	1,3	0,93	0,92	88,2	98,1	1635	5	45,6
18	13,85	26,4	94,5	-0,1	0,94	0,90	75,4	96,8	1298	10	39,8
19	13,87	28,6	94,7	2,1	0,94	0,91	81,9	97,3	1212	8	6,5
20	14,23	26,4	97,1	-0,1	0,89	0,88	79,6	99,5	2520	8	36,2
21	14,56	24,6	99,4	-1,9	0,85	0,83	78,1	97,2	2800	8	9,8
22	14,87	26,5	101,5	0,0	0,81	0,77	88,0	100,0	2797	7	0,6
23	14,58	26,5	99,5	0,0	0,85	0,83	84,2	91,5	2738	7	0,5
24	14,05	24,7	95,9	-1,8	0,91	0,91	72,6	94,7	1607	7	28,0
25	13,87	24,9	94,7	-1,6	0,94		71,2		608	2	5,4
25-CP									913	4	6,4
26	14,81	25,2	101,1	-1,3	0,82		83,0		3731	5	0,5
26-CP									1719	3	8,9
27	14,69	26,4	100,3	-0,1	0,83	0,87	85,4	98,9	5560	8	0,7

ANEXO F

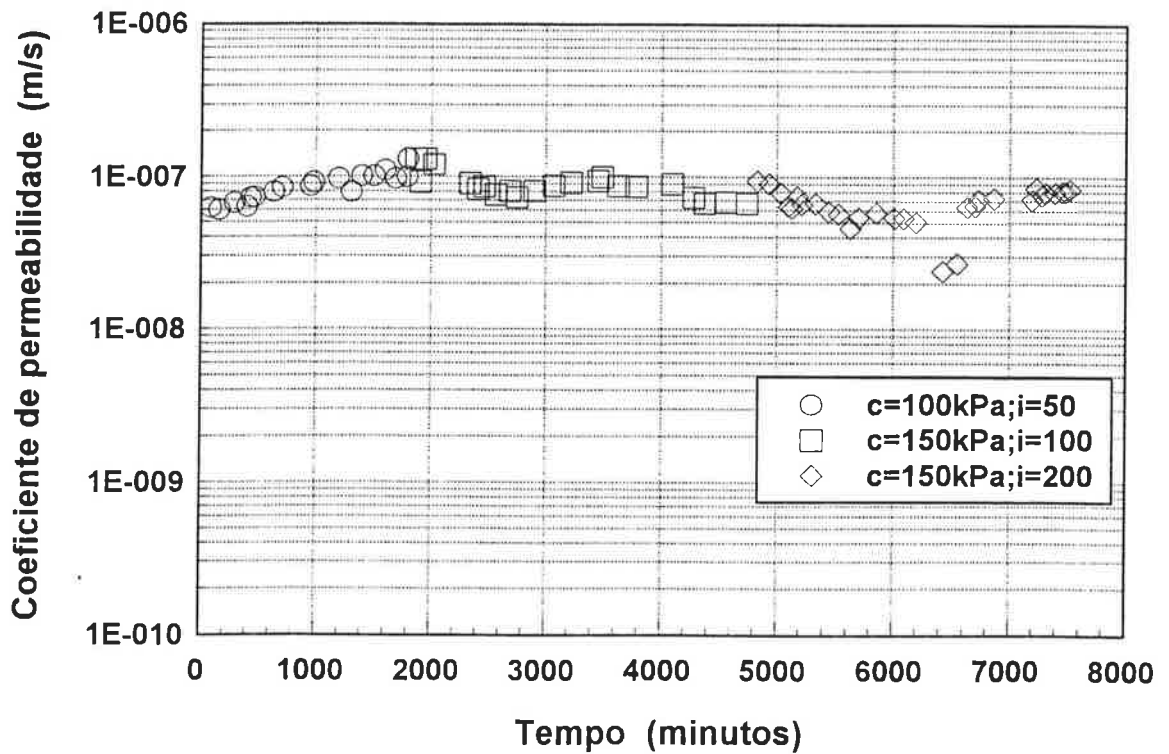
RESULTADOS DOS ENSAIOS DE PERMEABILIDADE

COEFICIENTE DE PERMEABILIDADE EM FUNÇÃO DO TEMPO DE ENSAIO

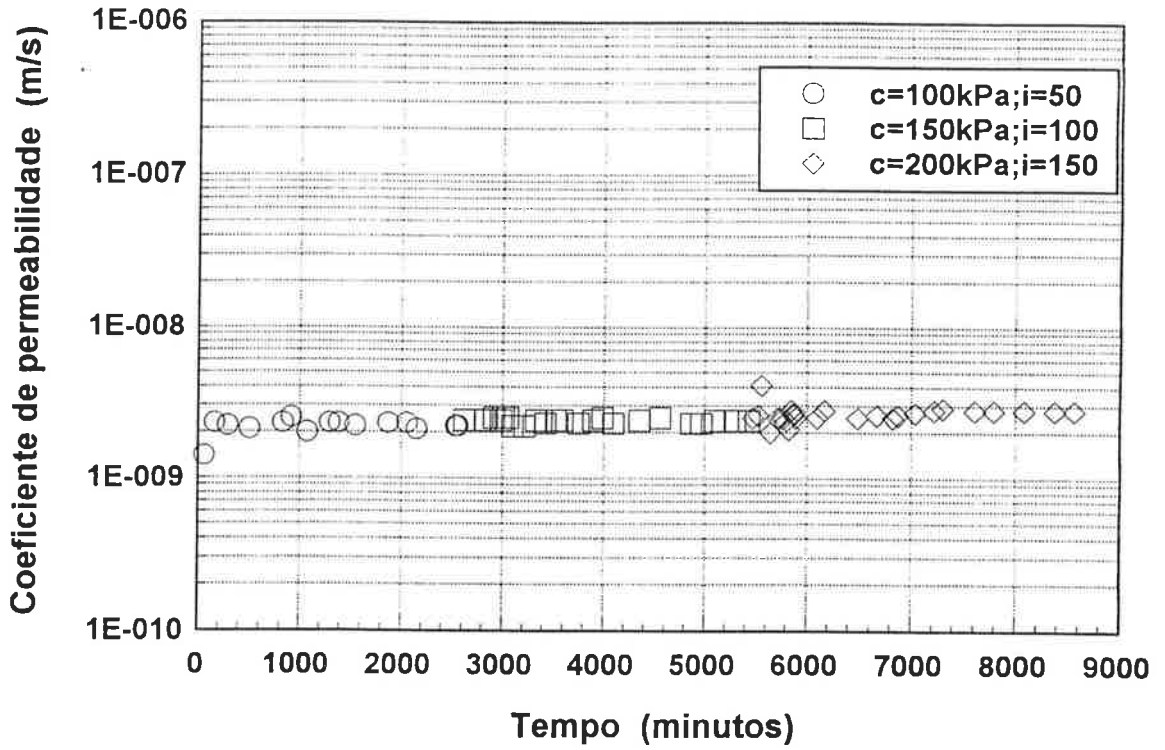
CP 1
GC=103,4% e $\Delta h=-1,2\%$



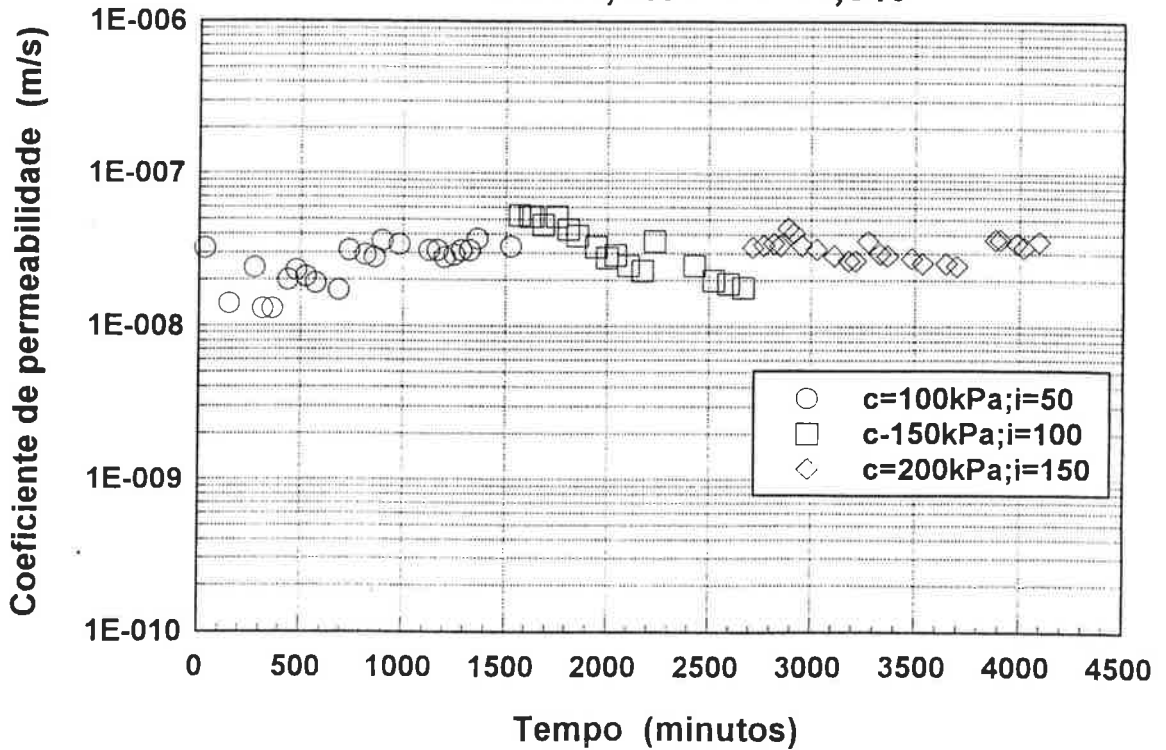
CP 2
GC=97,3% e $\Delta h=-0,6\%$

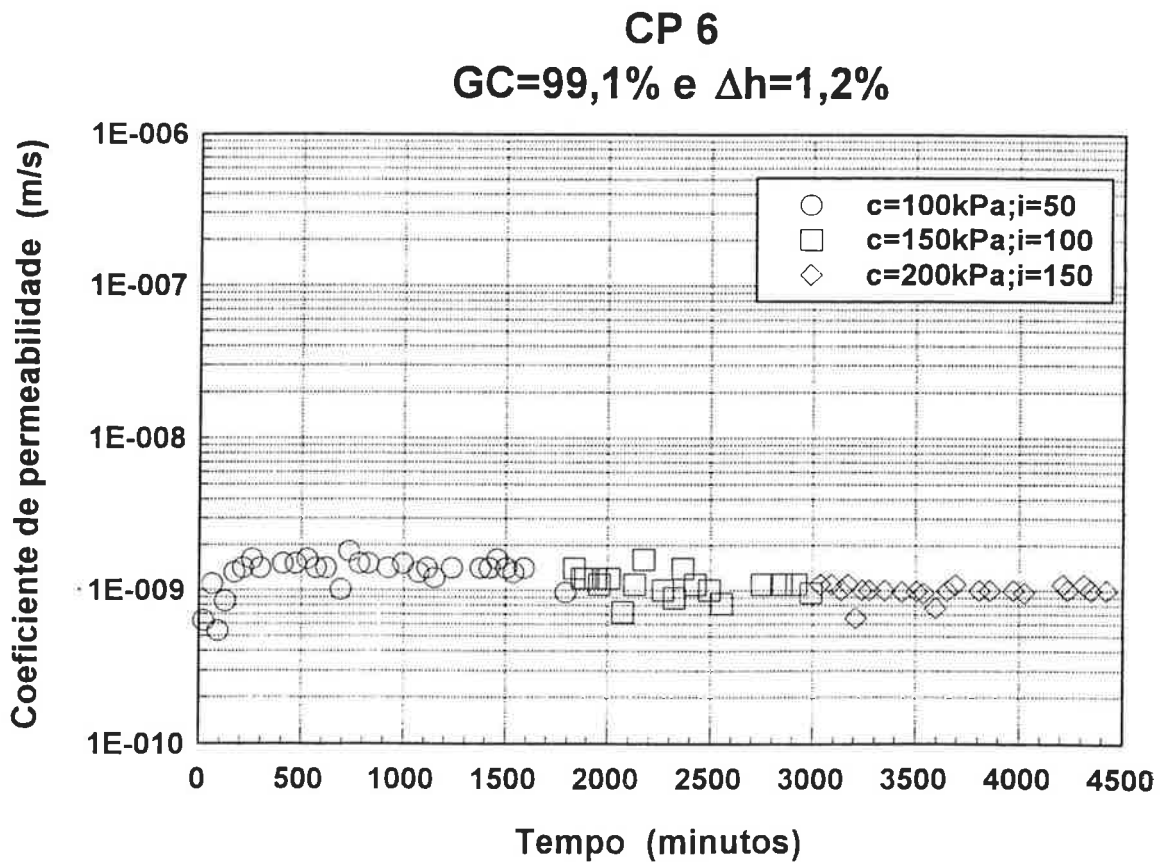
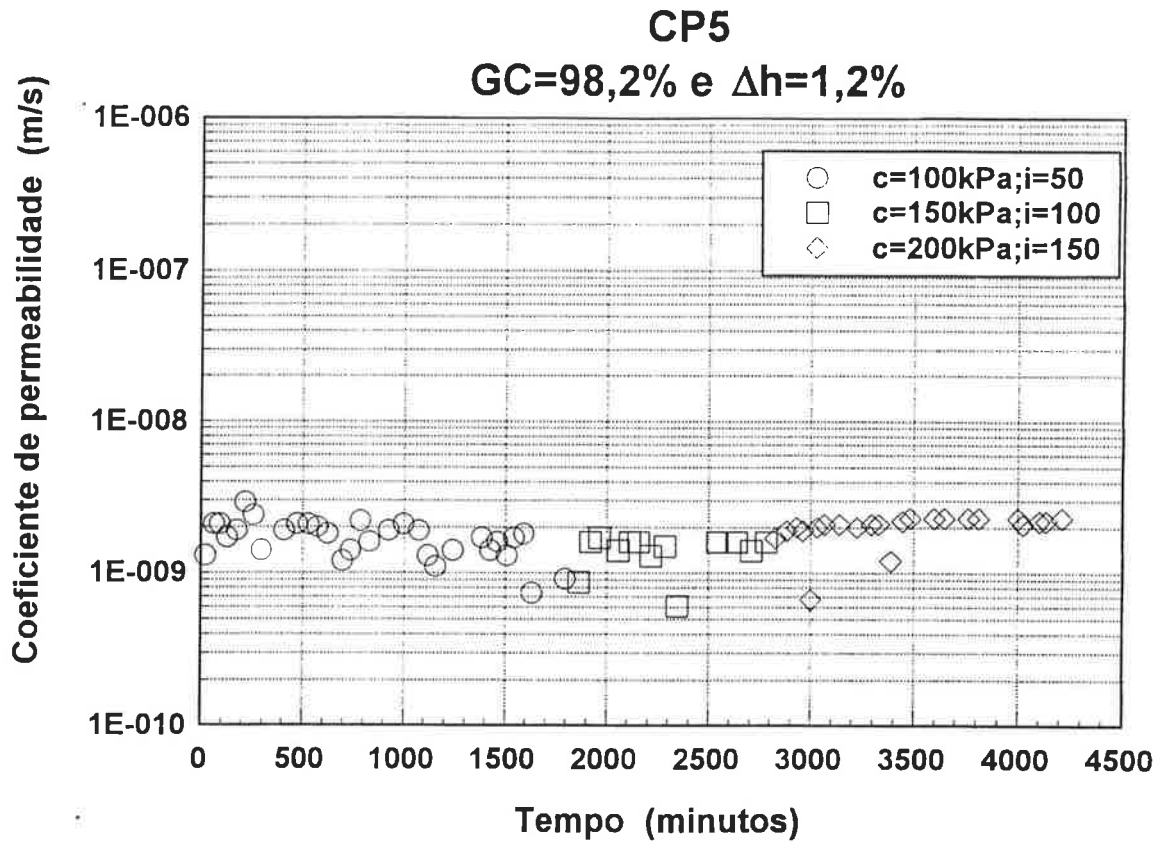


CP 3
GC=99,9% e $\Delta h=1,2\%$

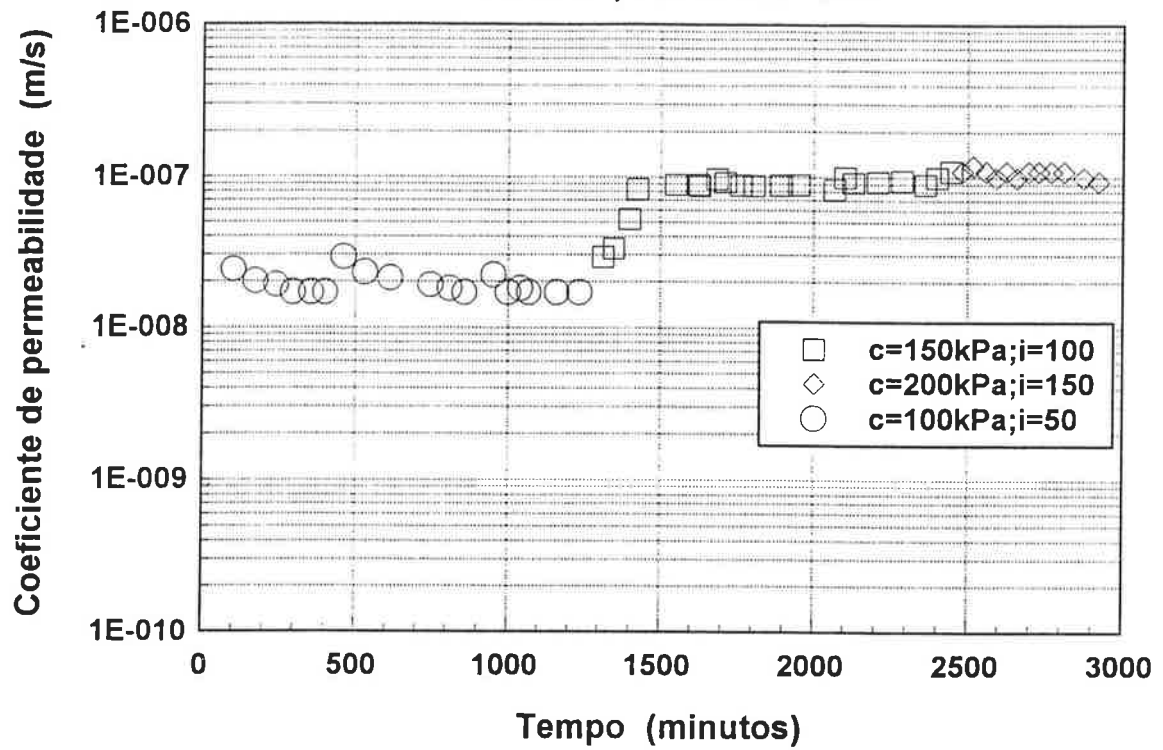


CP 4
GC=94,3% e $\Delta h=1,9\%$

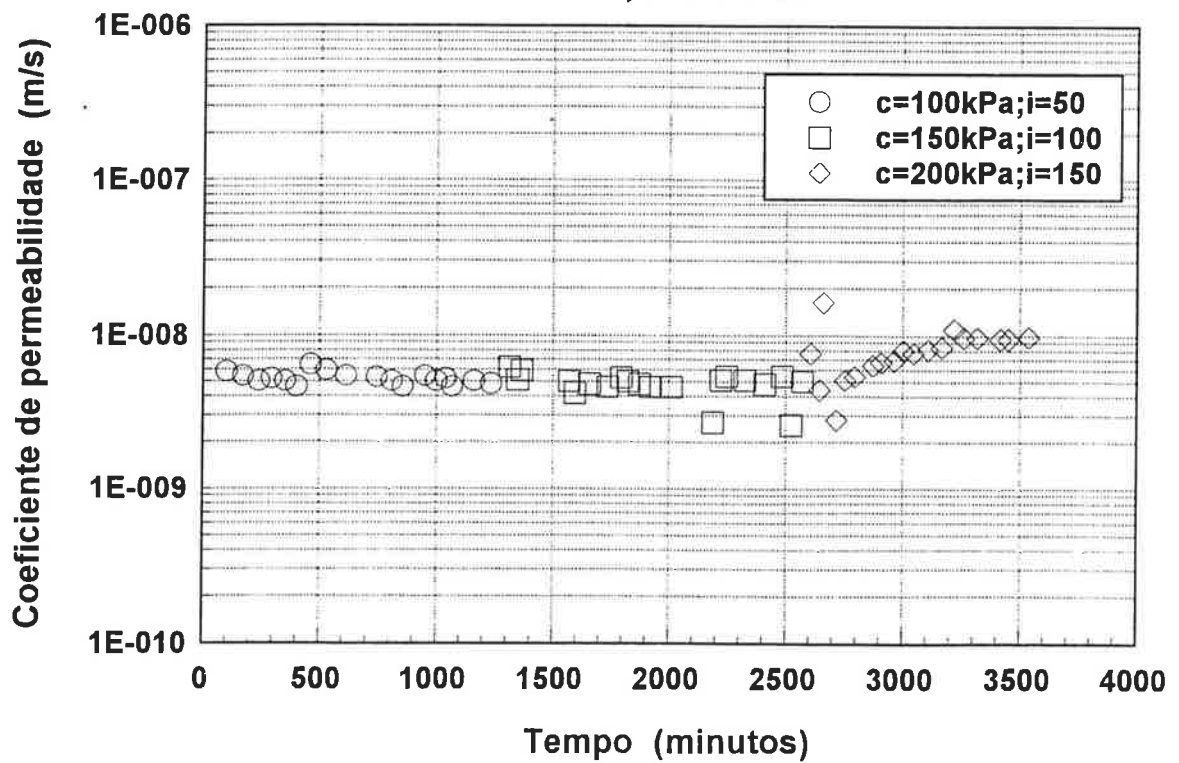




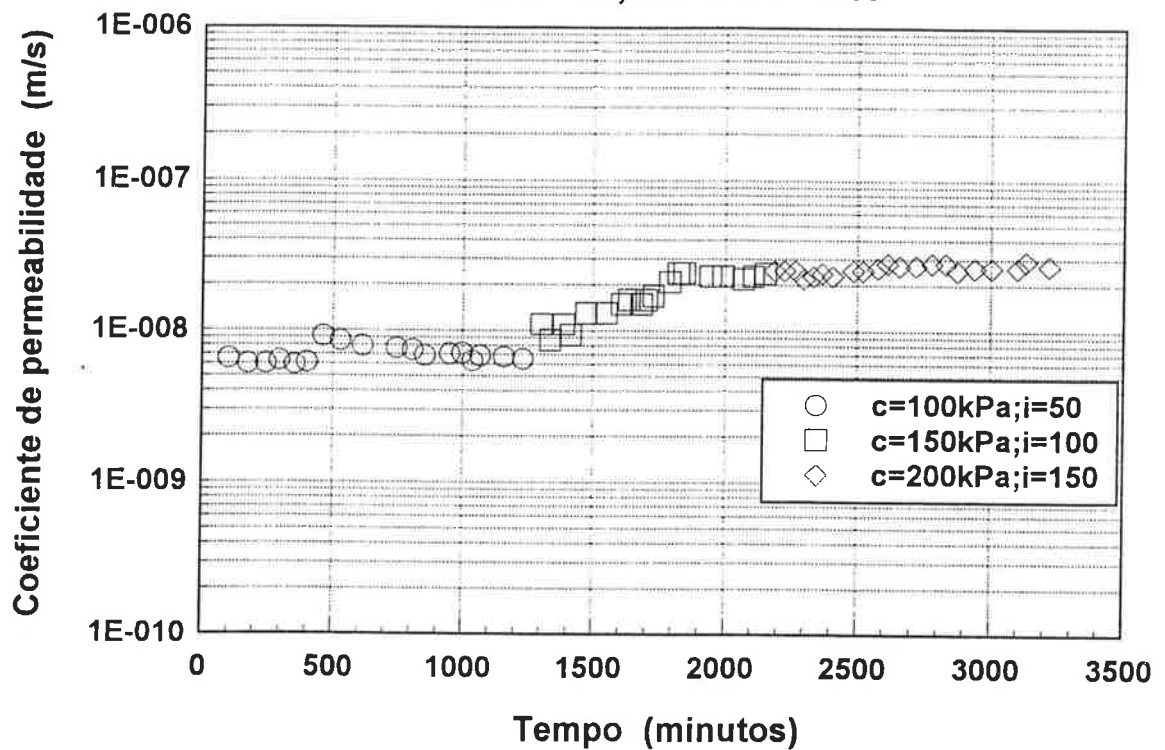
CP 7
GC=95,1% e $\Delta h=0\%$



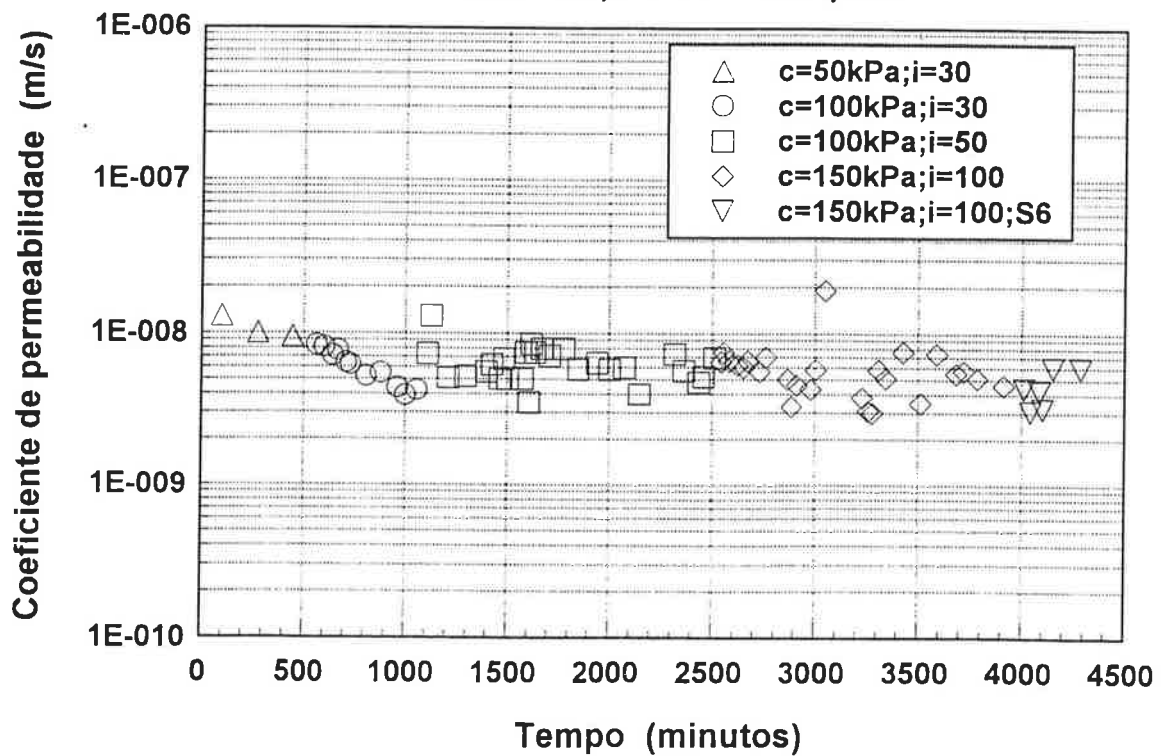
CP 8
GC=96,8% e $\Delta h=0\%$

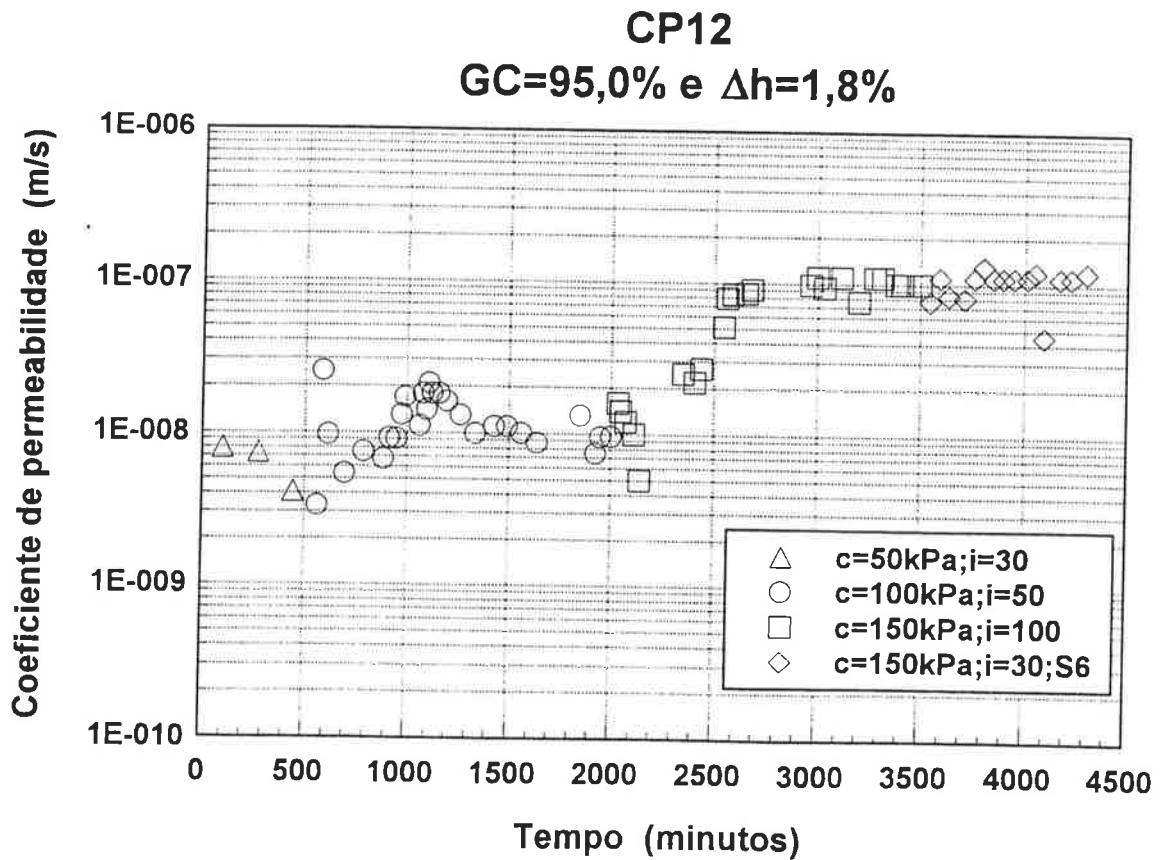
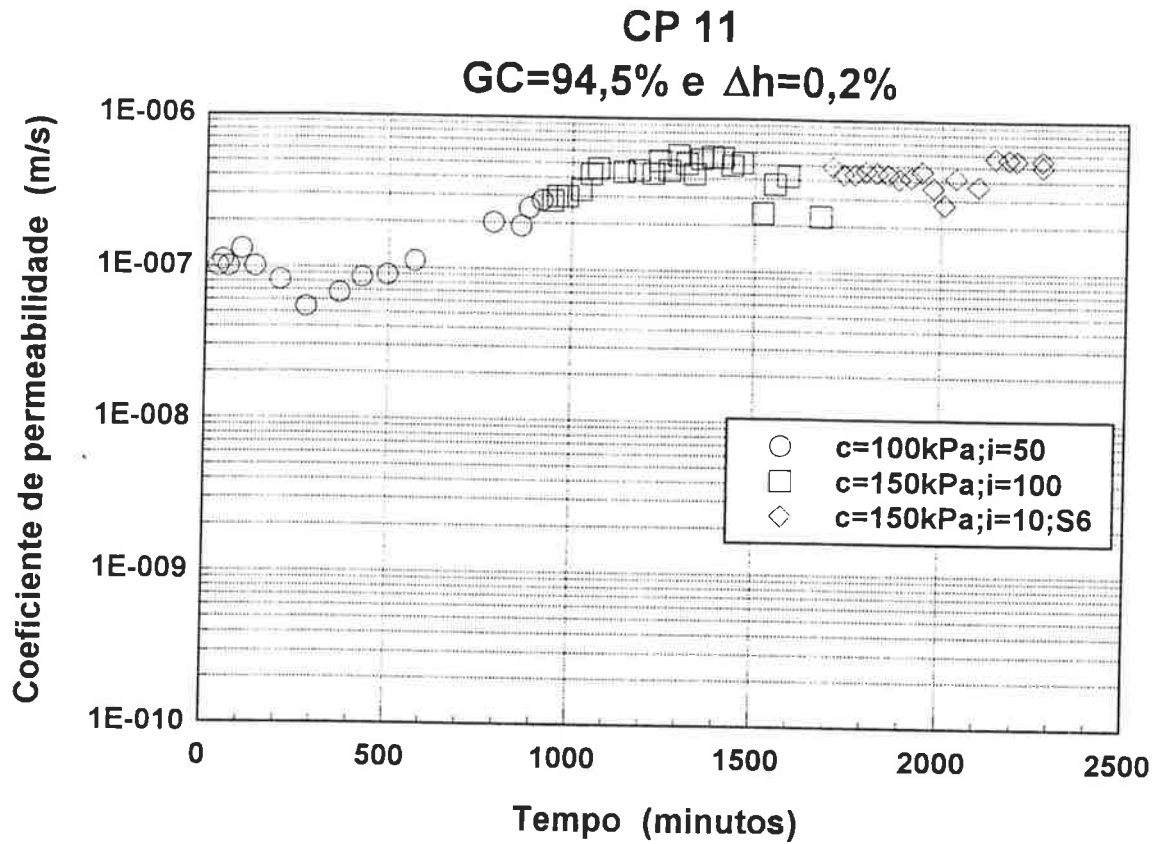


CP 9
GC=98,6% e $\Delta h=0\%$

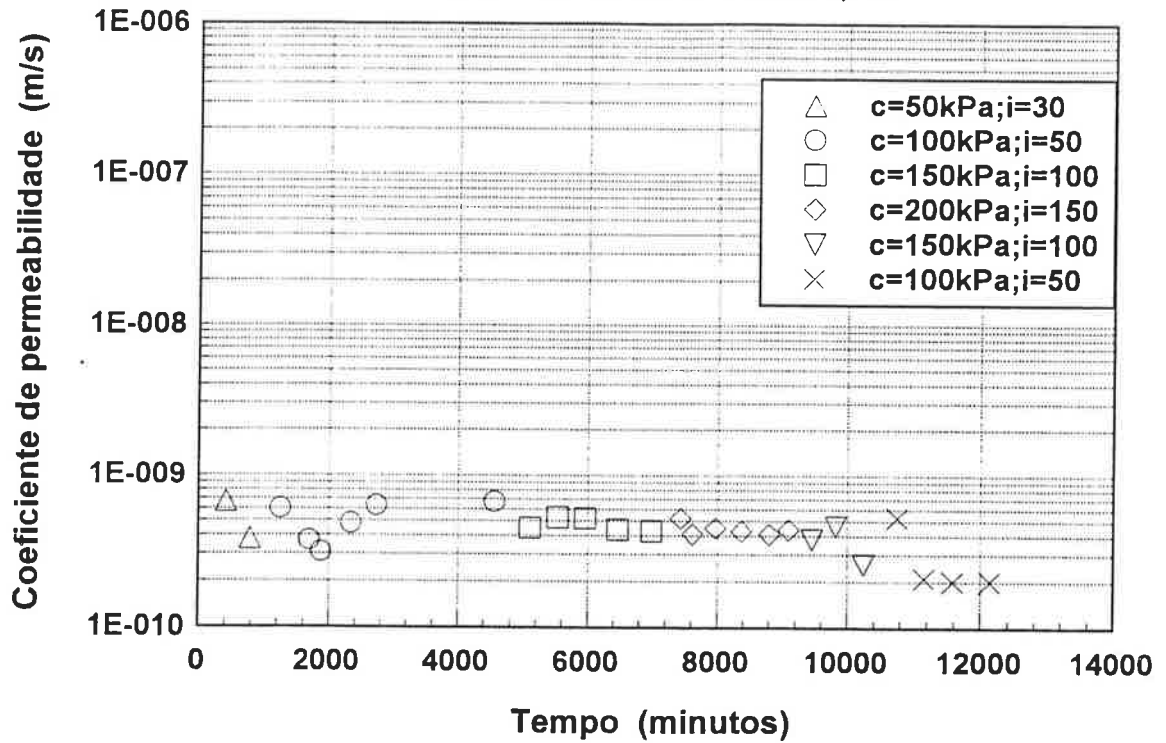


CP 10
GC=99,7% e $\Delta h=0,5\%$

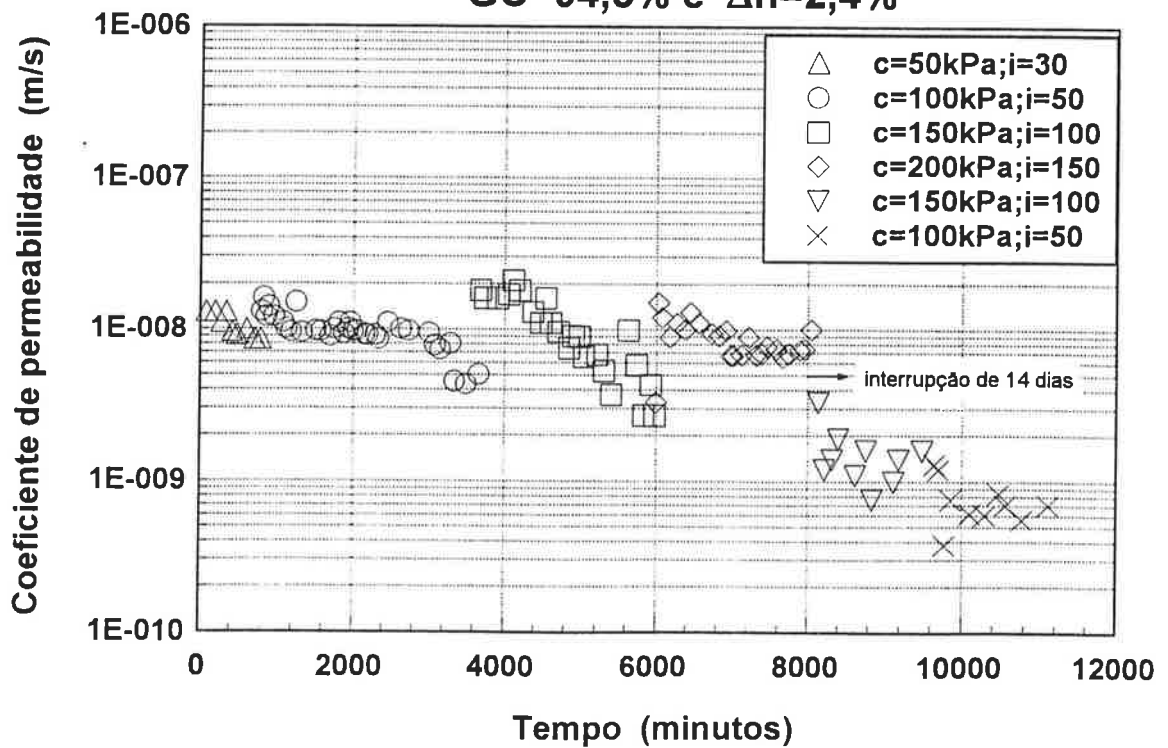




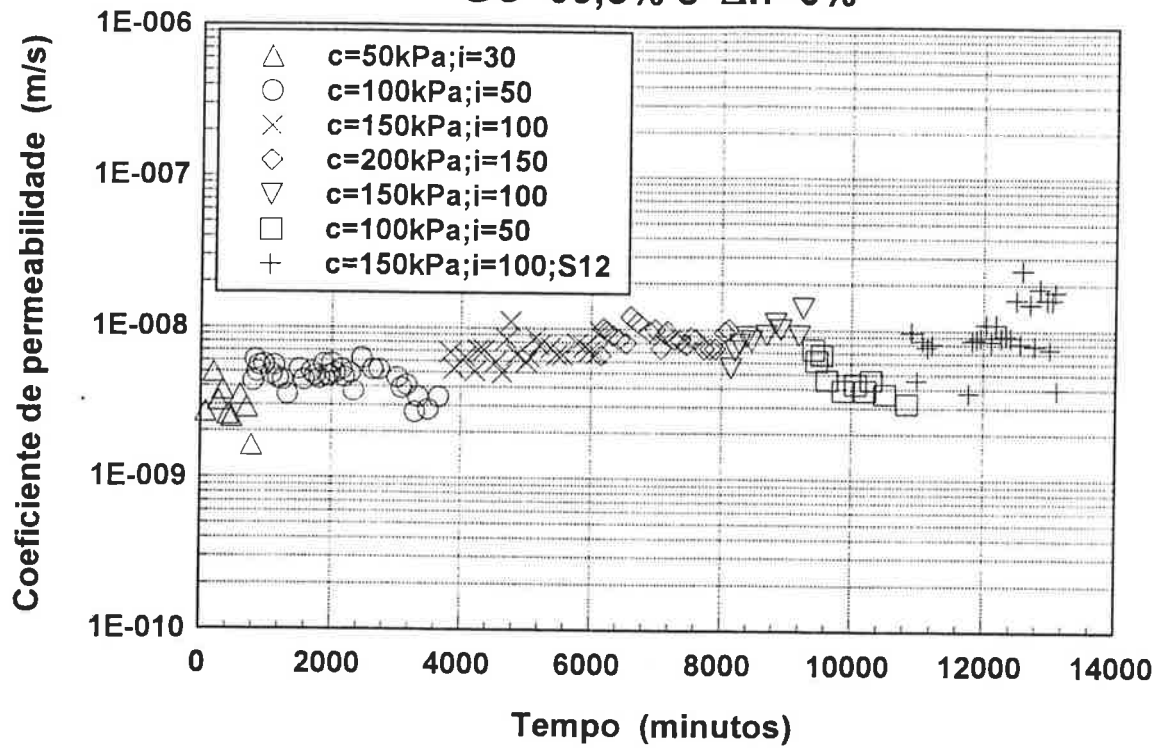
CP 13
GC=101,7% e $\Delta h=-1,8\%$



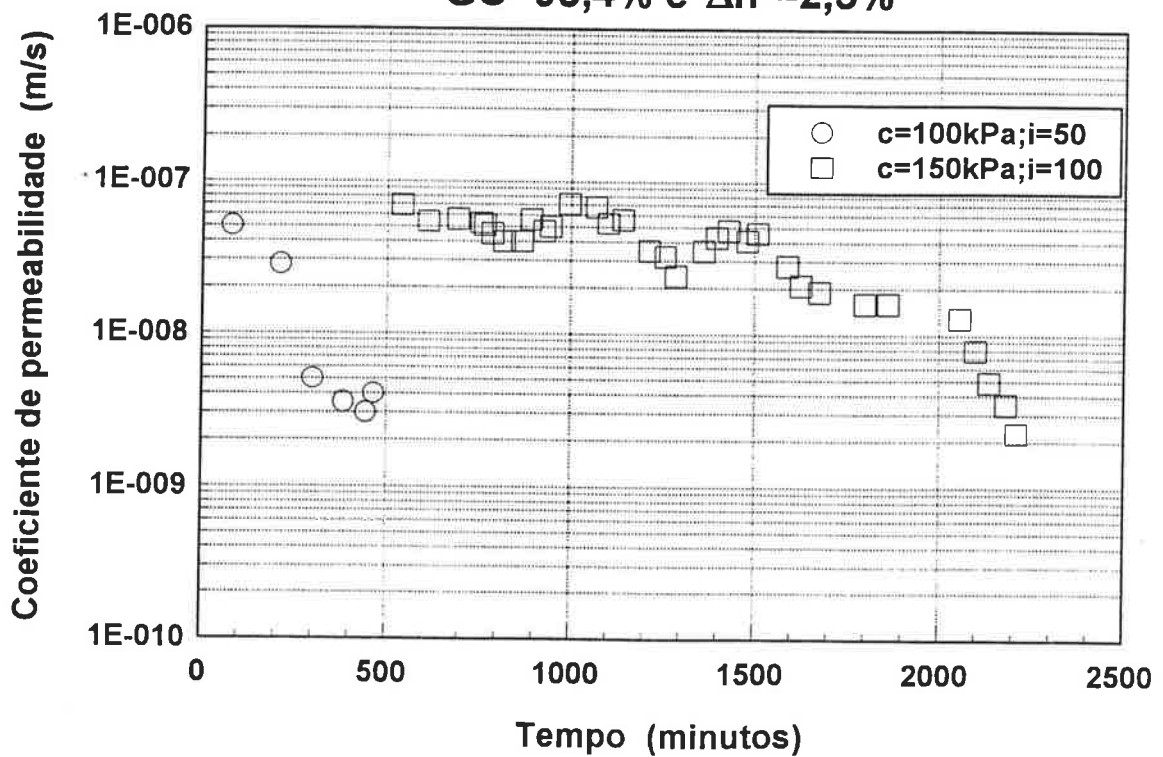
CP14
GC=94,5% e $\Delta h=2,4\%$



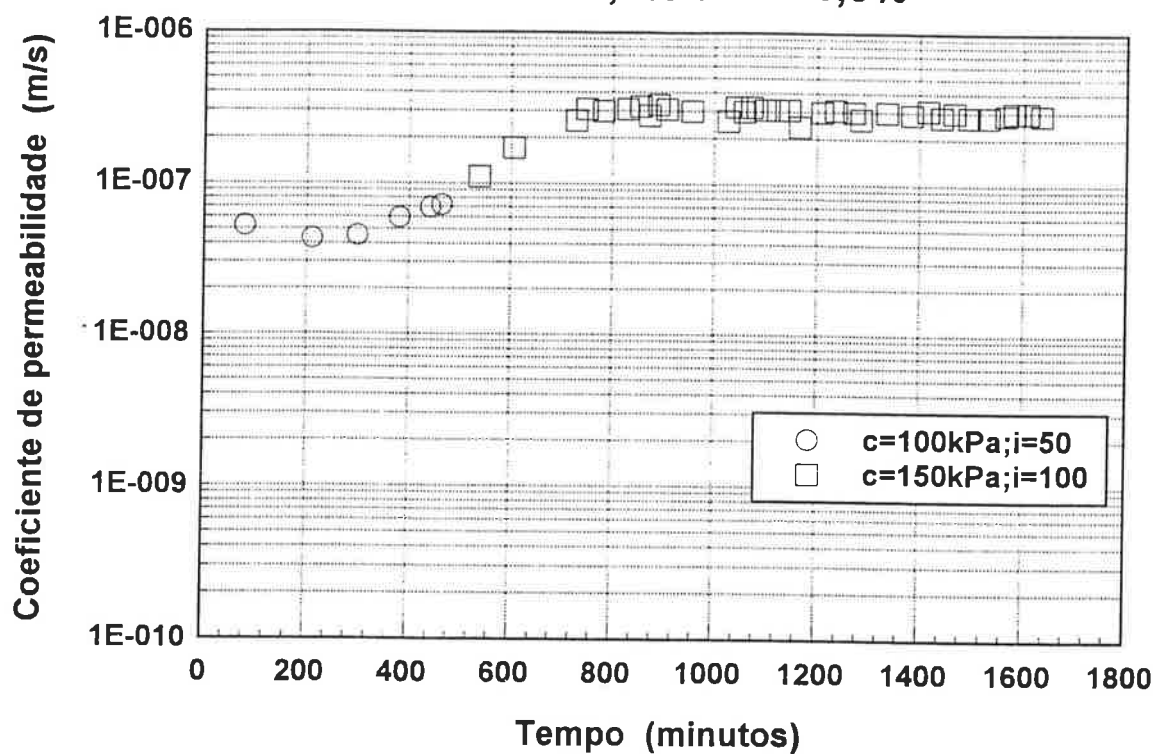
CP 15
GC=99,3% e $\Delta h=0\%$



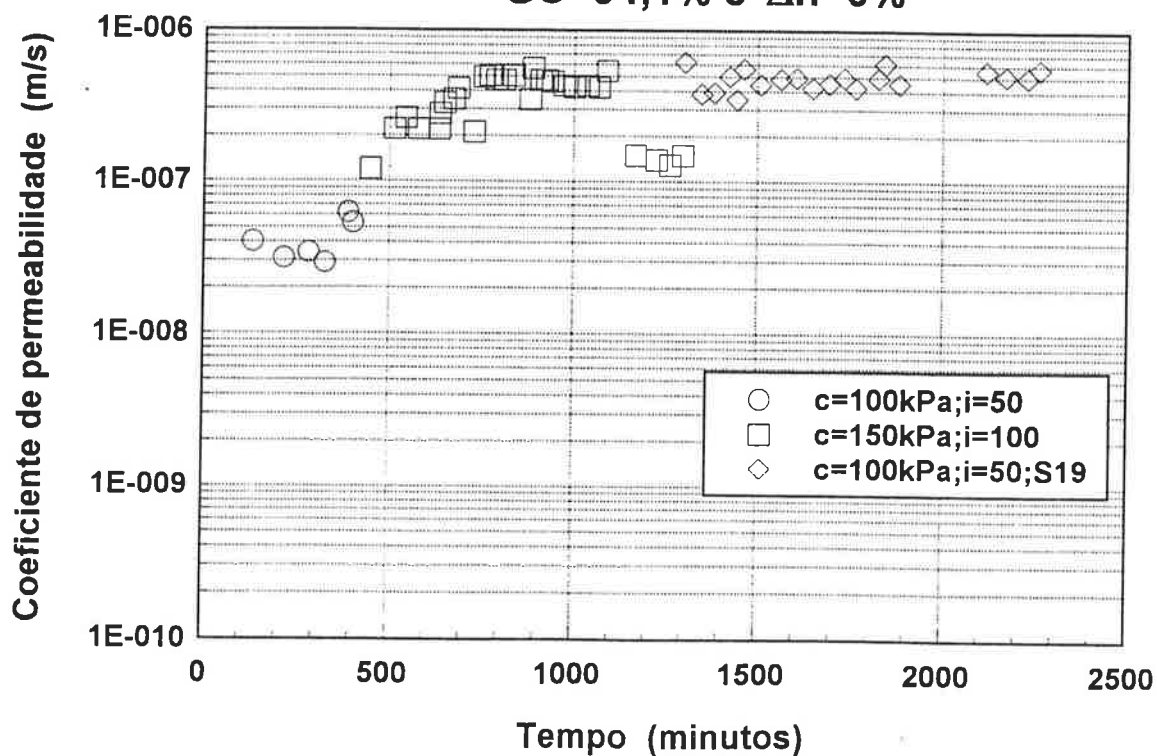
CP 16
GC=95,4% e $\Delta h=-2,5\%$



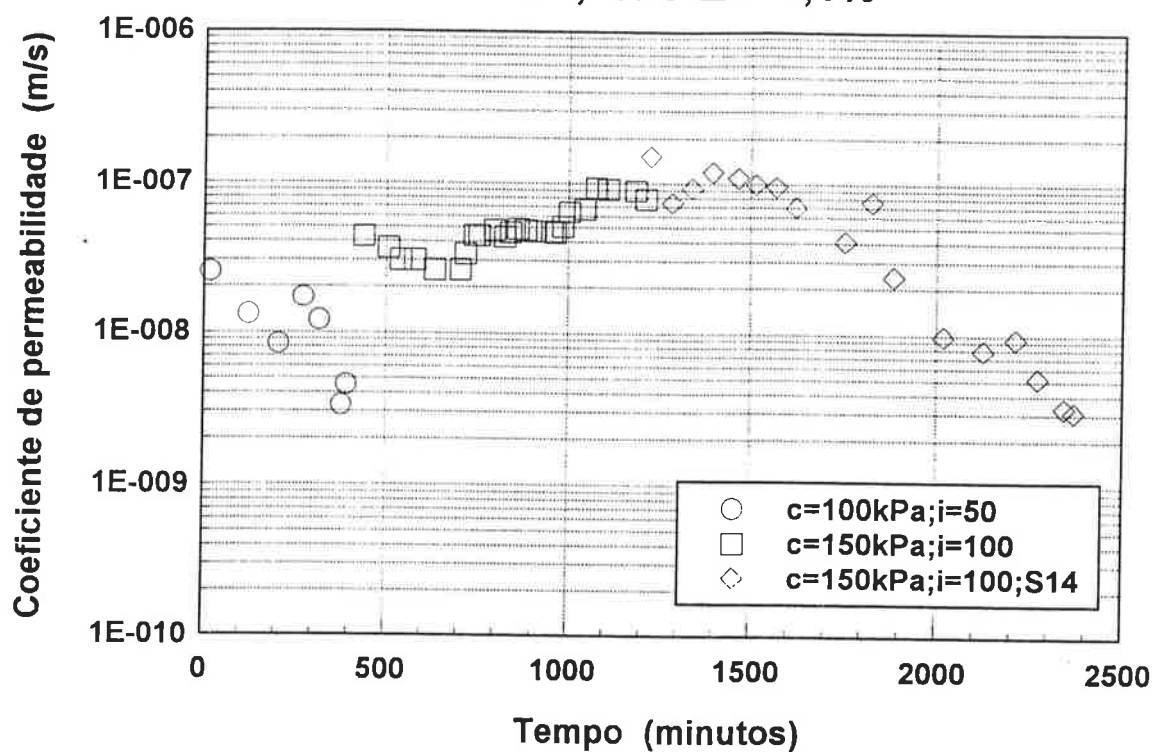
CP 17
GC=95,1% e $\Delta h=1,3\%$



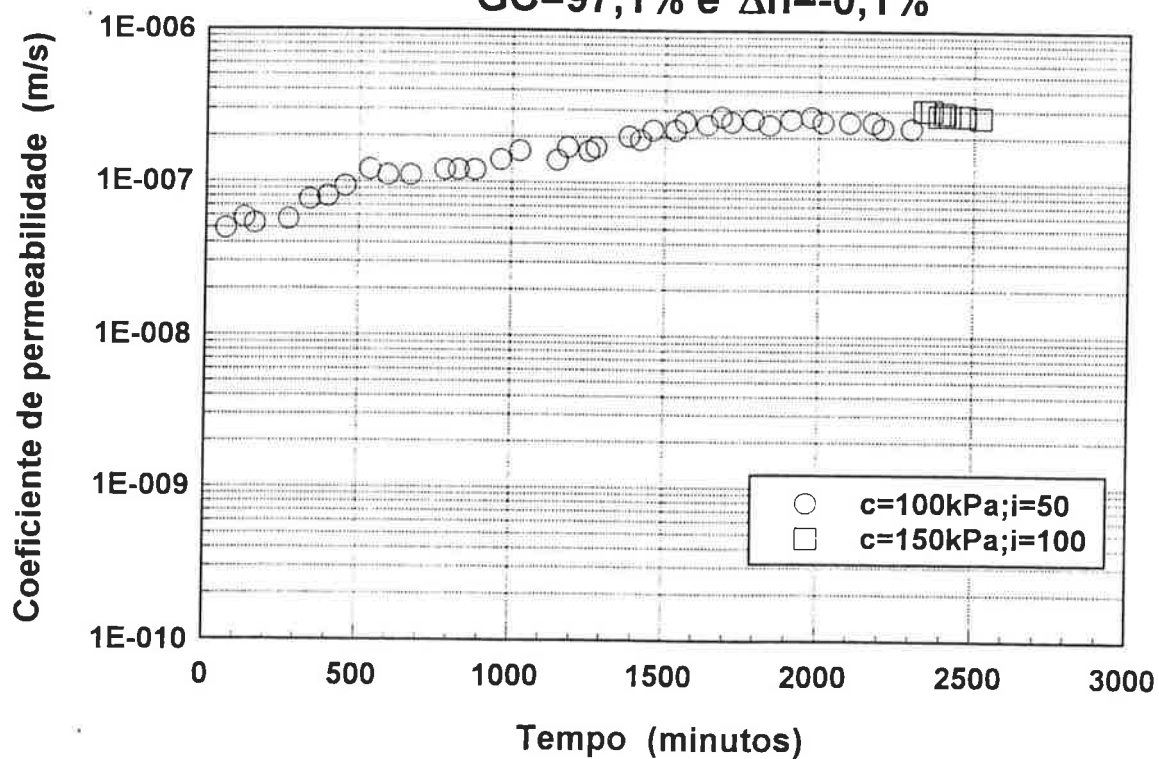
CP 18
GC=94,1% e $\Delta h=0\%$

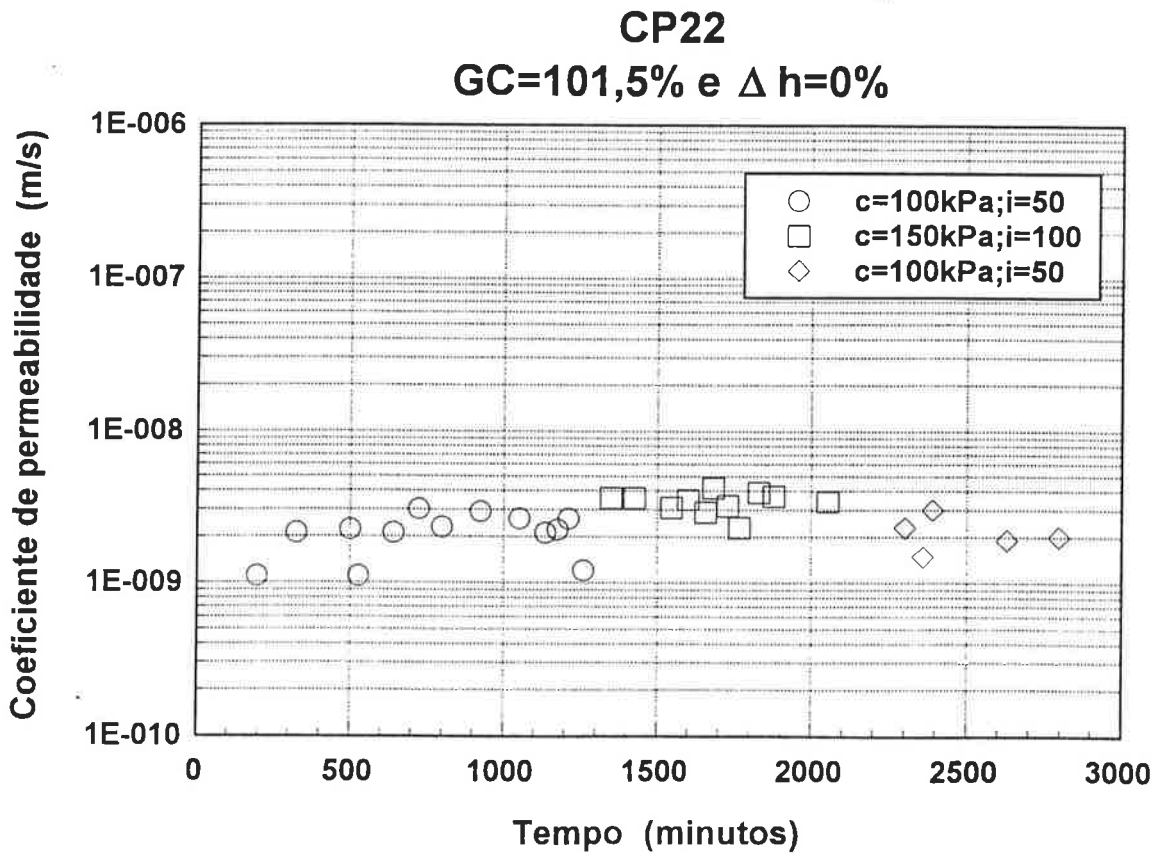
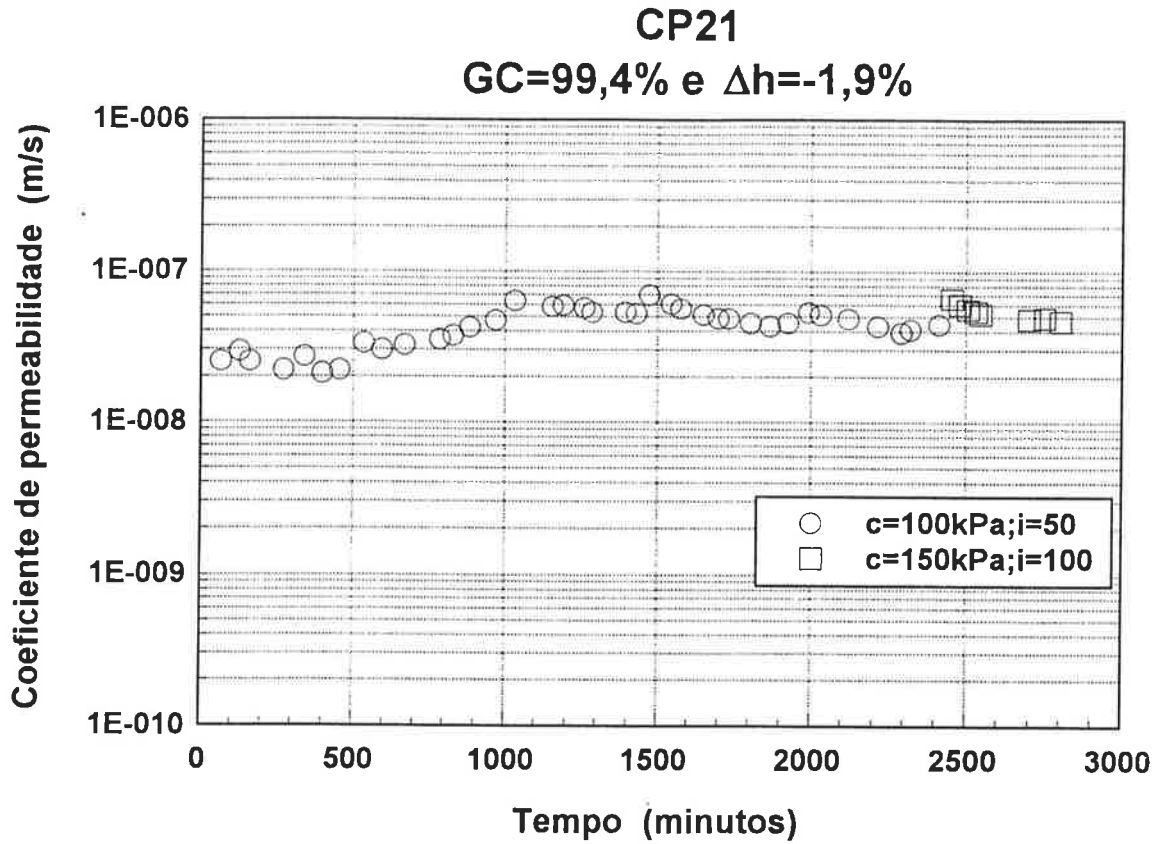


CP 19
GC=94,7% e $\Delta h=2,1\%$

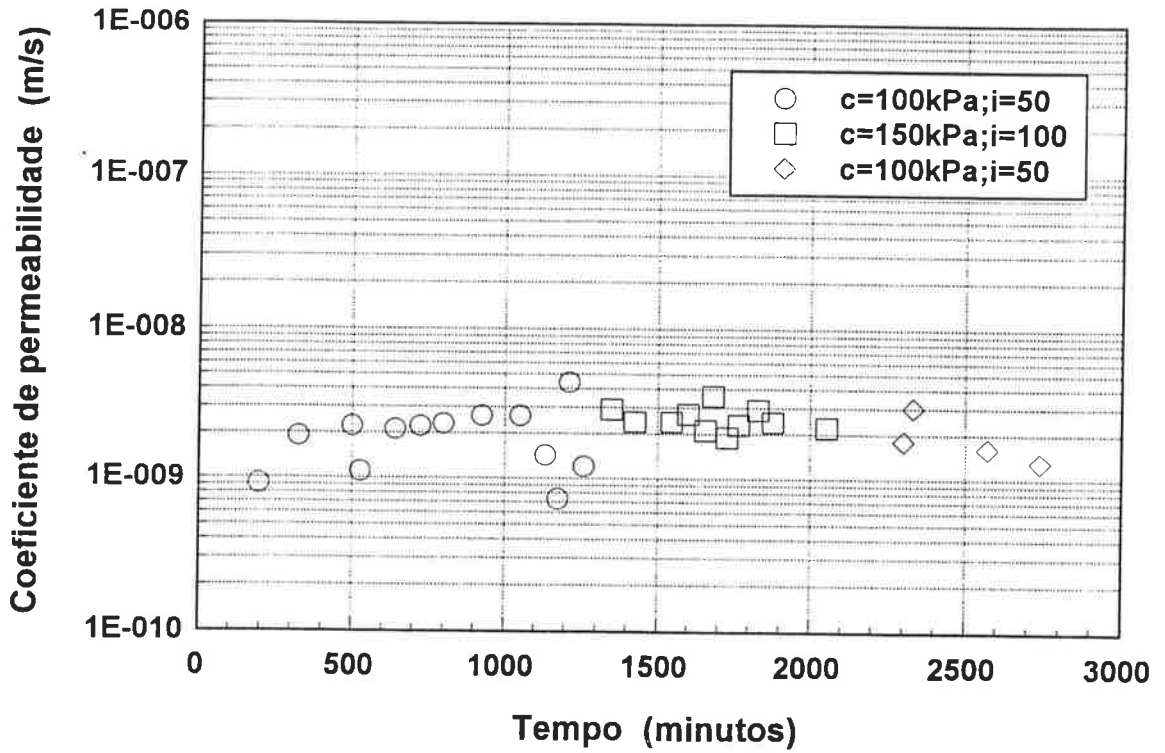


CP 20
GC=97,1% e $\Delta h=-0,1\%$

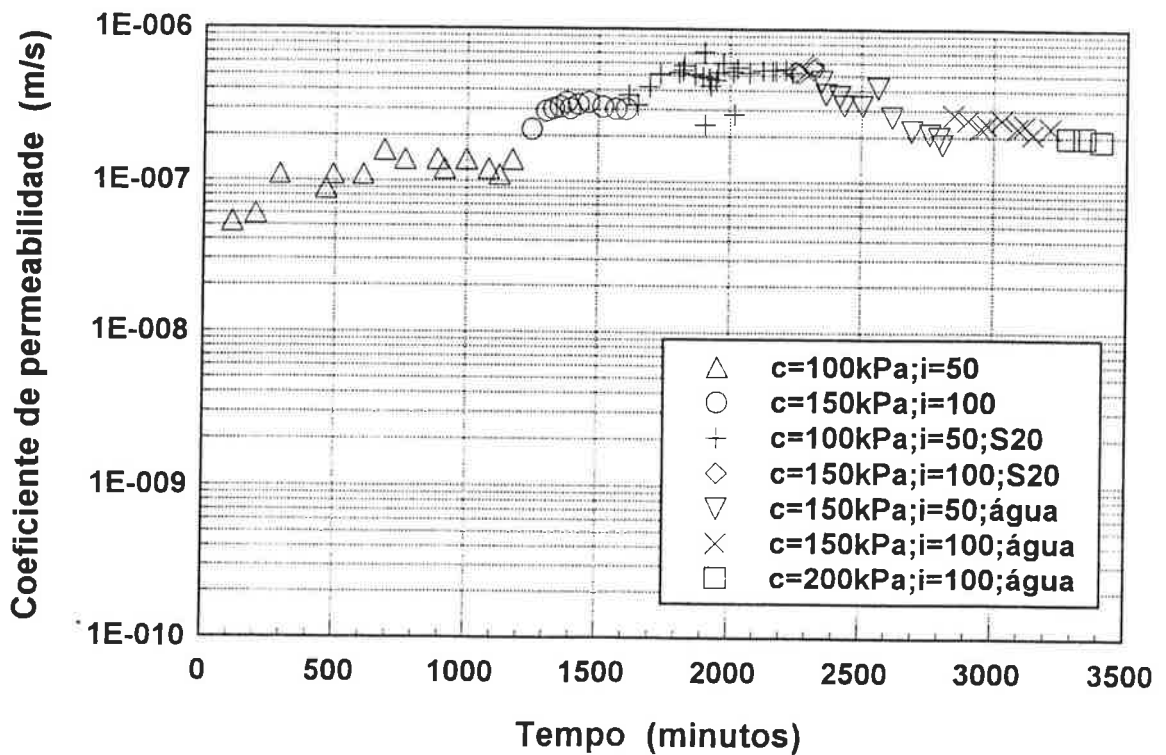




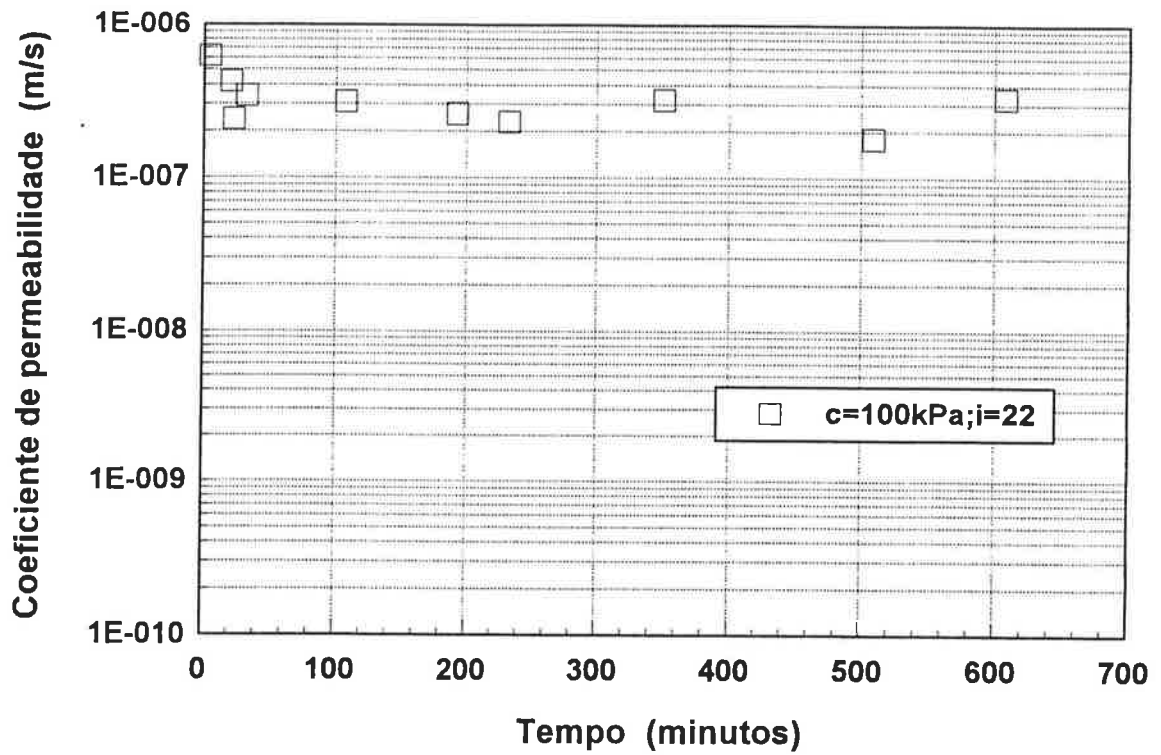
CP 23
GC=99,5% e $\Delta h=0\%$



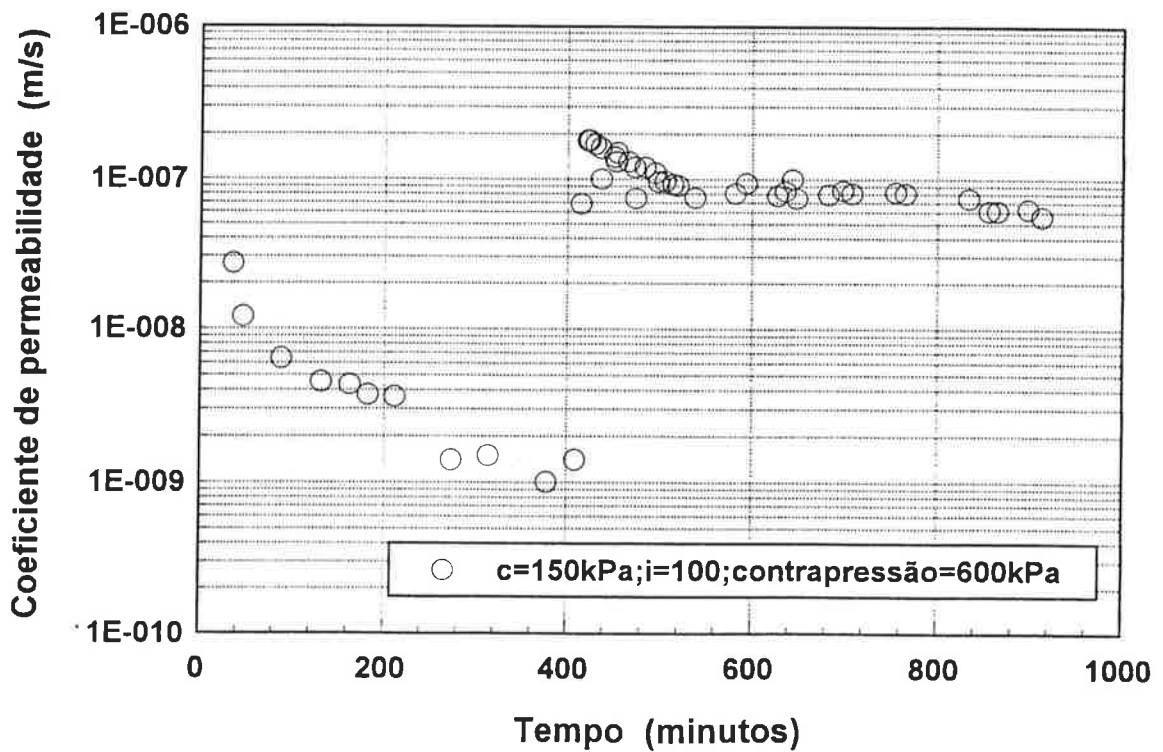
CP24
GC=95,9% e $\Delta h=-1,8\%$



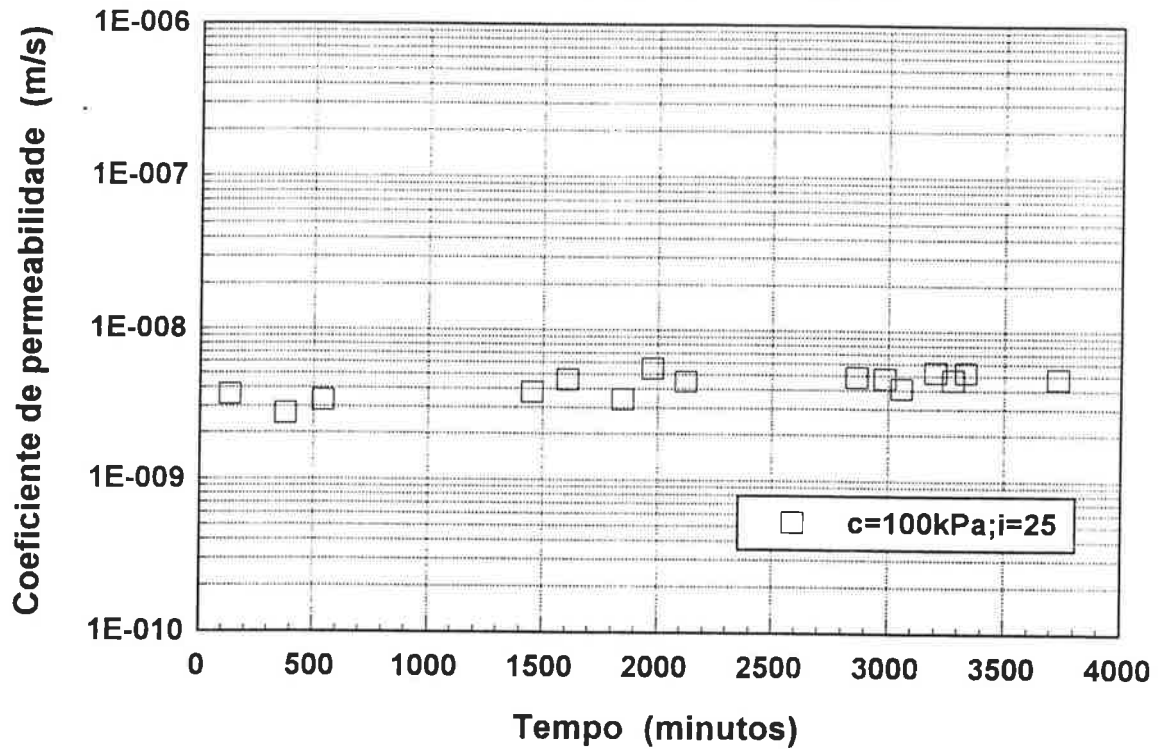
CP 25
GC=94,7% e $\Delta h=-1,6\%$



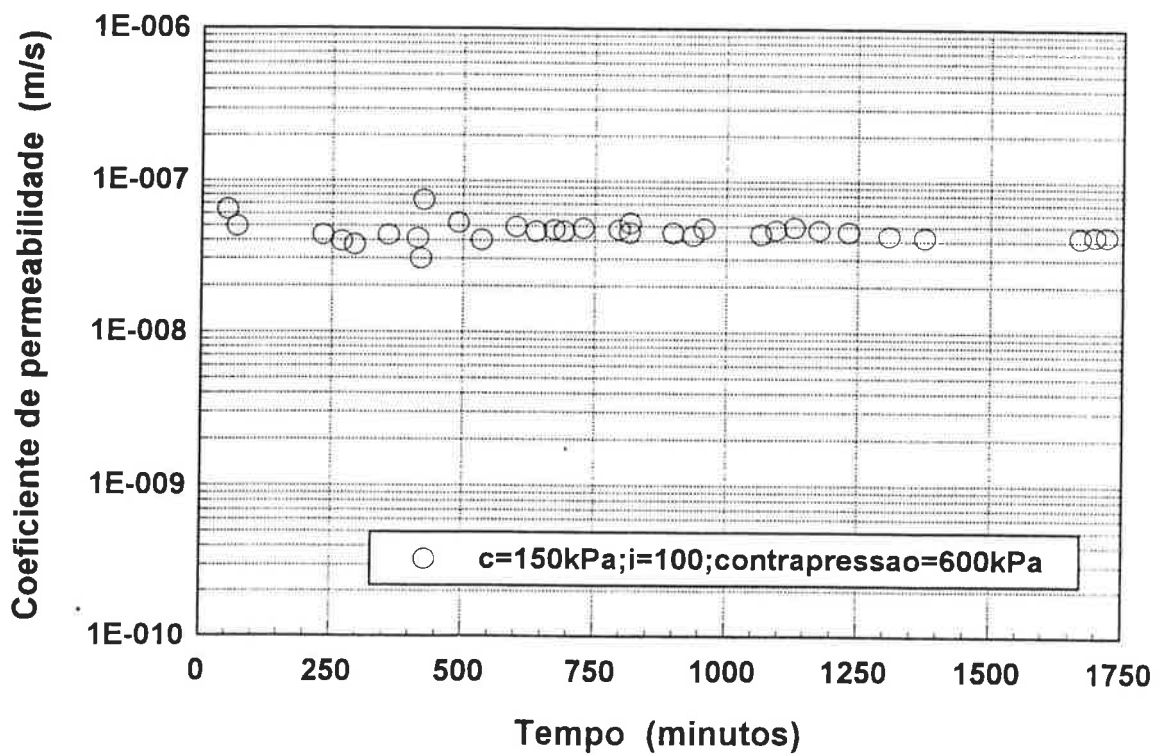
CP 25
GC=94,7% e $\Delta h=-1,6\%$



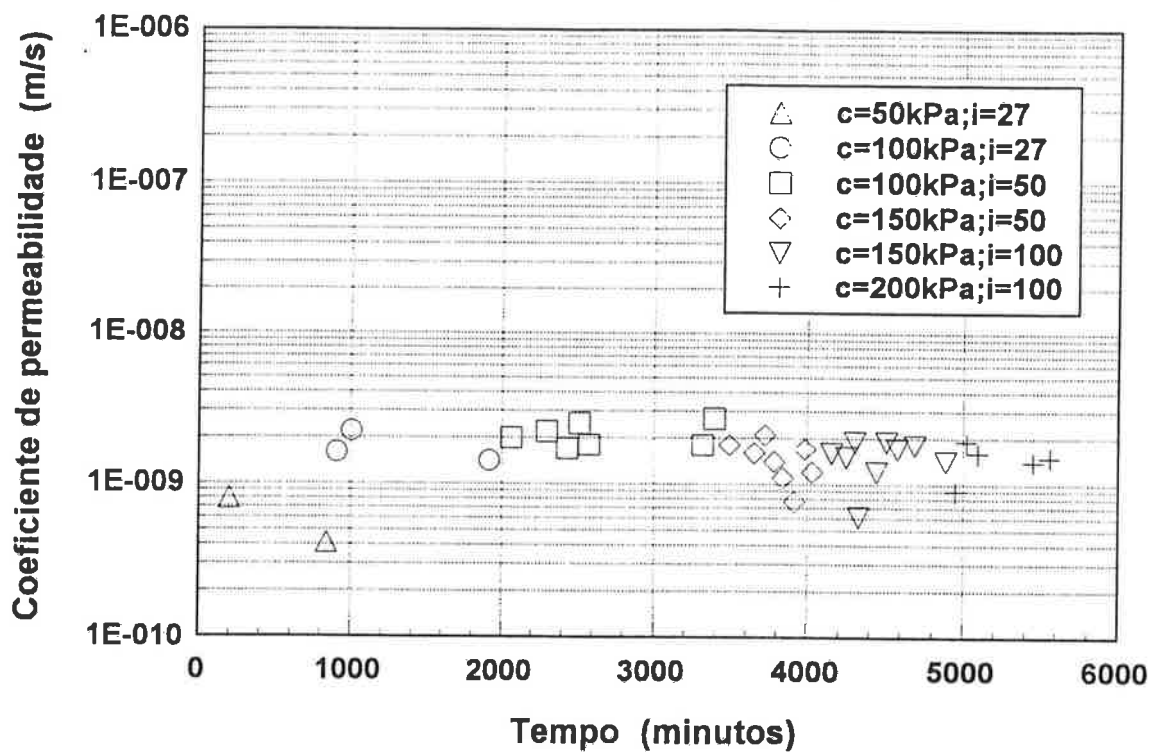
CP 26
GC=101,1% e $\Delta h=-1,3\%$



CP 26
GC=101,1% e $\Delta h=-1,3\%$



CP 27
GC=100,3% e $\Delta h=-0,1\%$

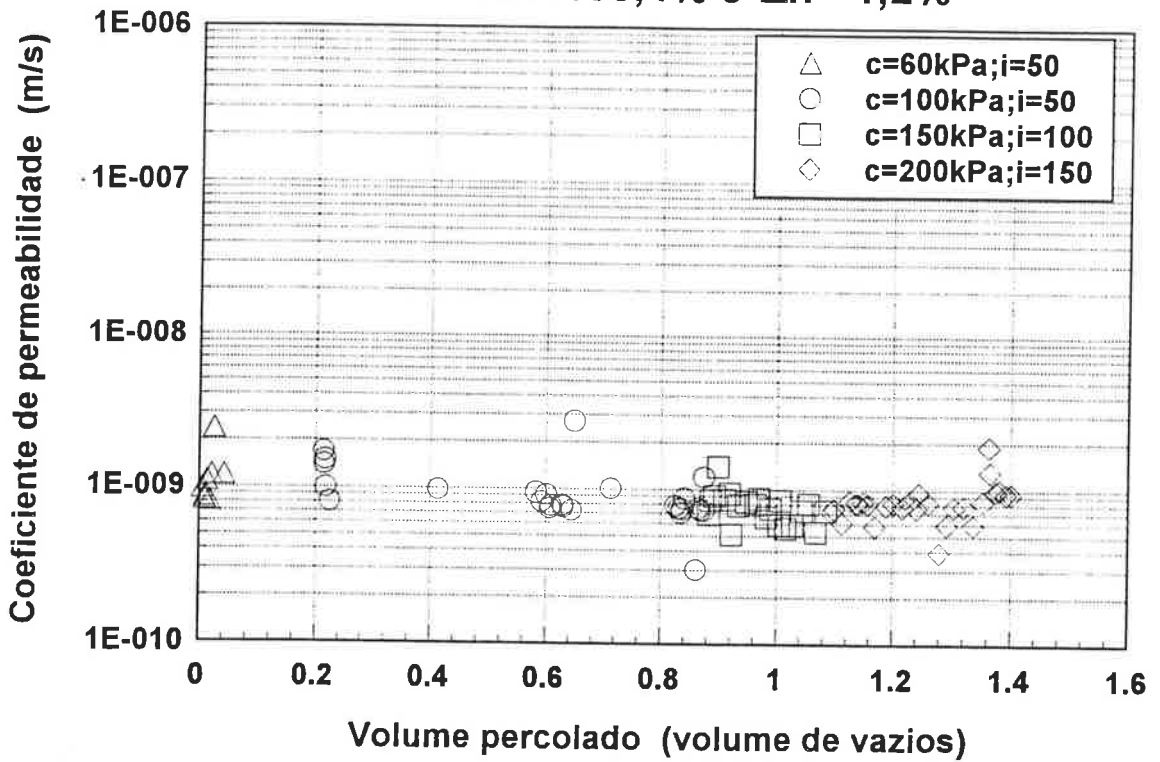


ANEXO G

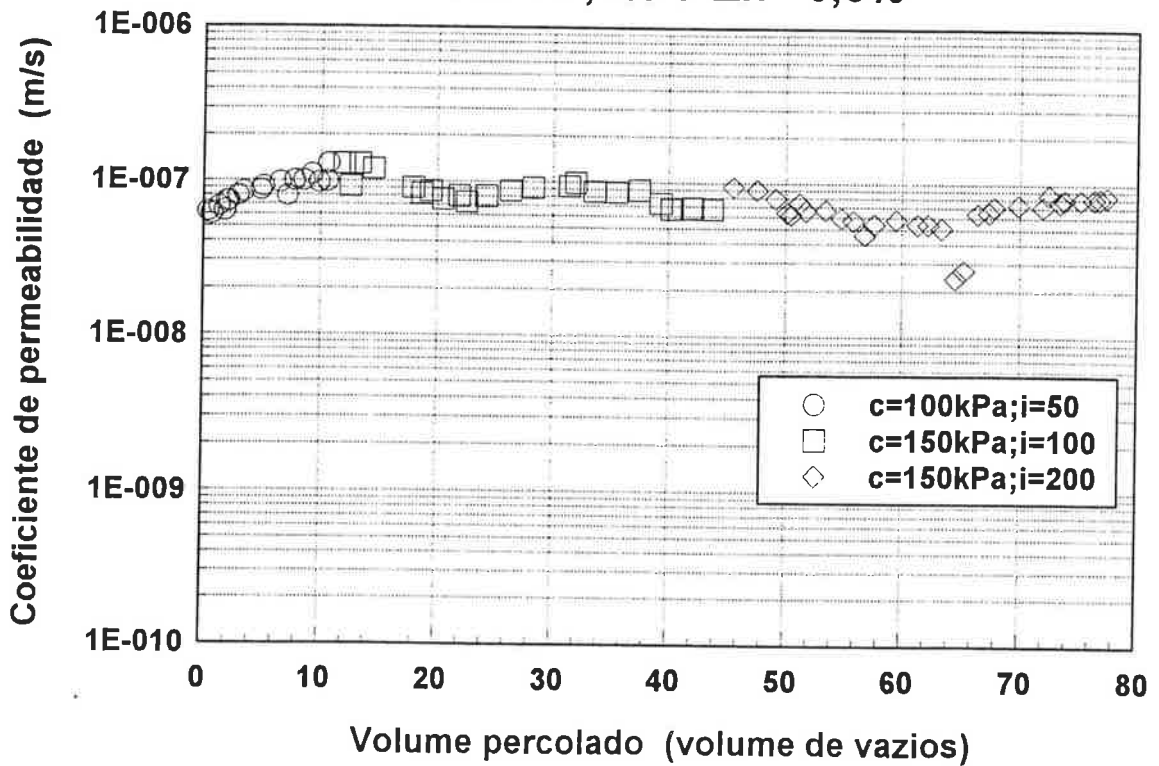
RESULTADOS DOS ENSAIOS DE PERMEABILIDADE

COEFICIENTE DE PERMEABILIDADE EM FUNÇÃO DO VOLUME PERCOLADO (EXPRESSO EM VOLUMES DE VAZIOS DO CORPO-DE-PROVA)

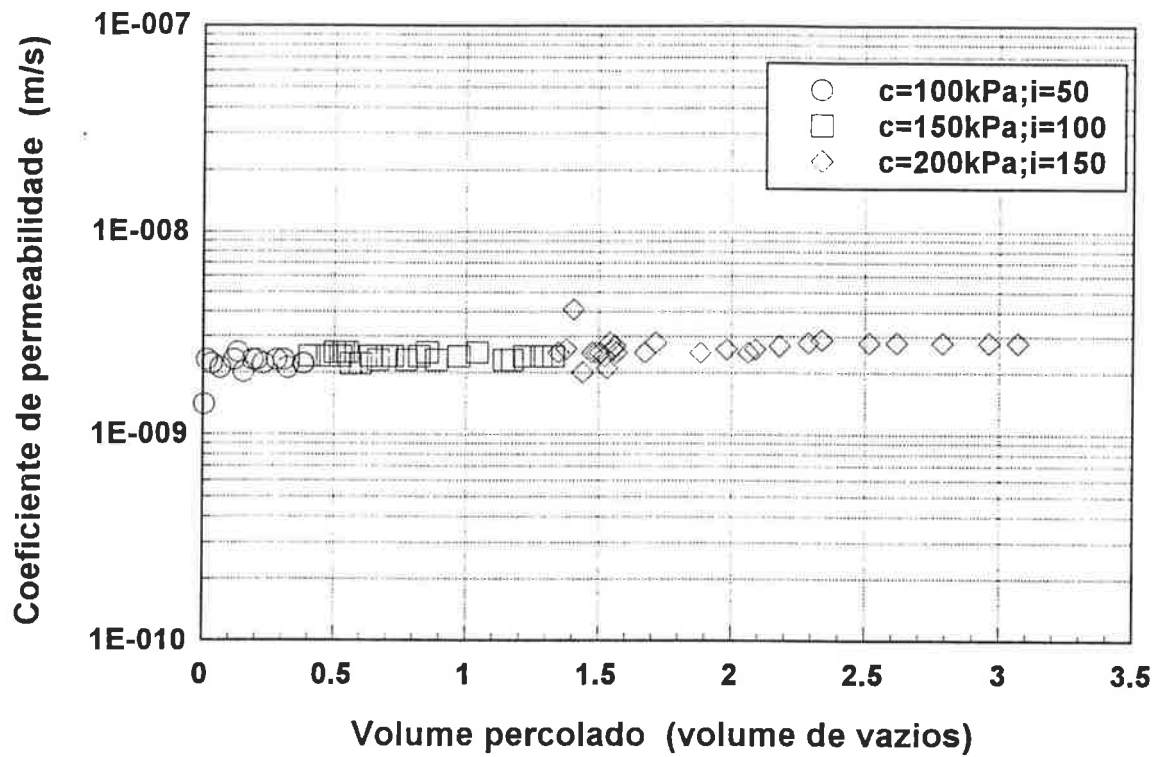
CP 1
GC=103,4% e $\Delta h=-1,2\%$



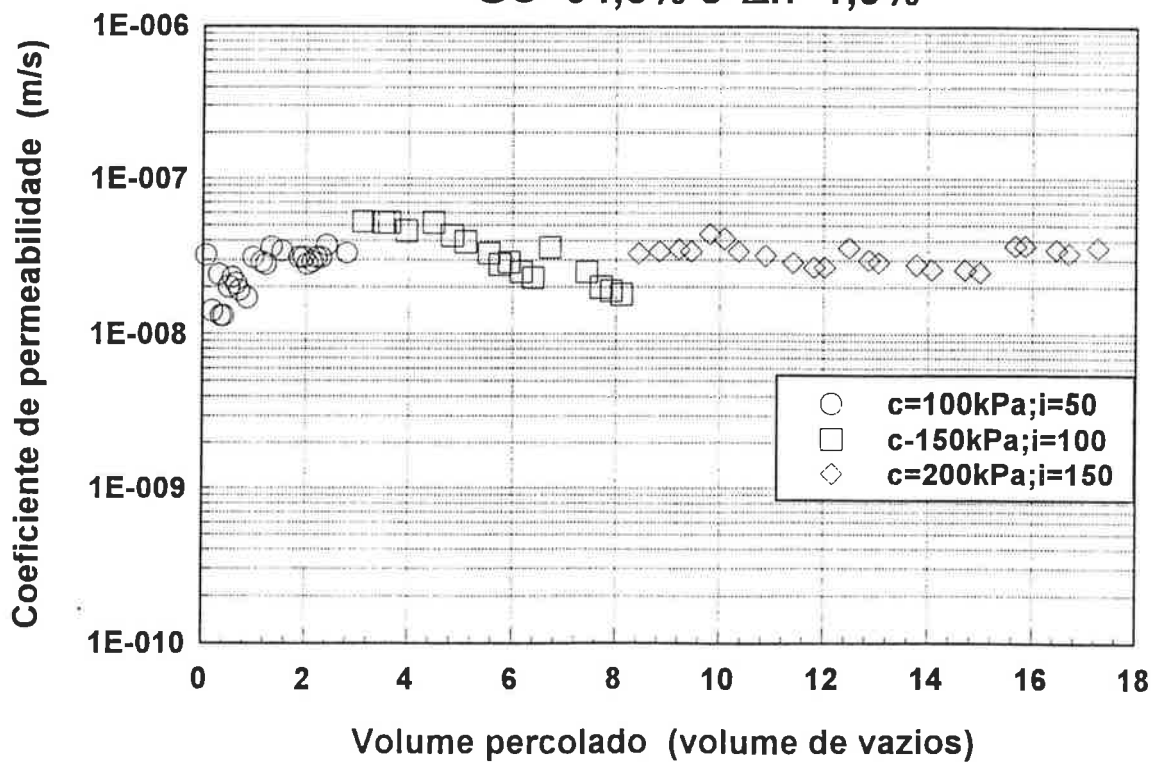
CP 2
GC=97,3% e $\Delta h=-0,6\%$



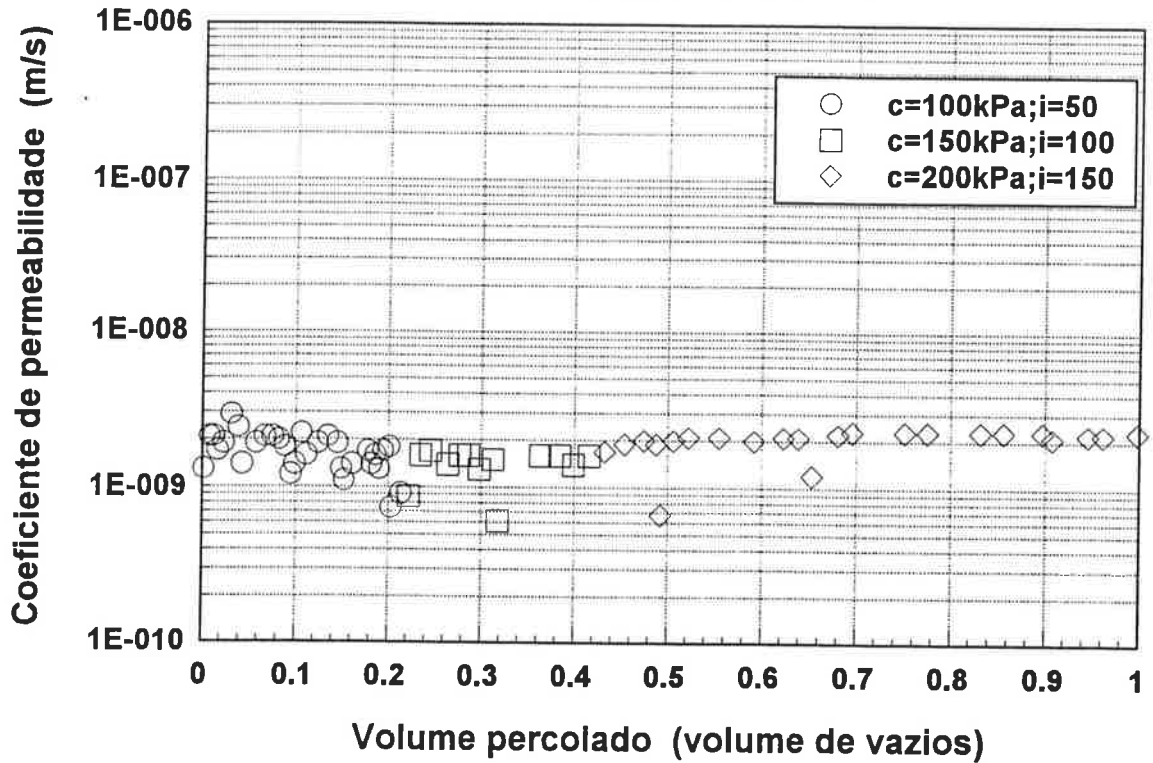
CP 3
GC=99,9% e $\Delta h=1,2\%$



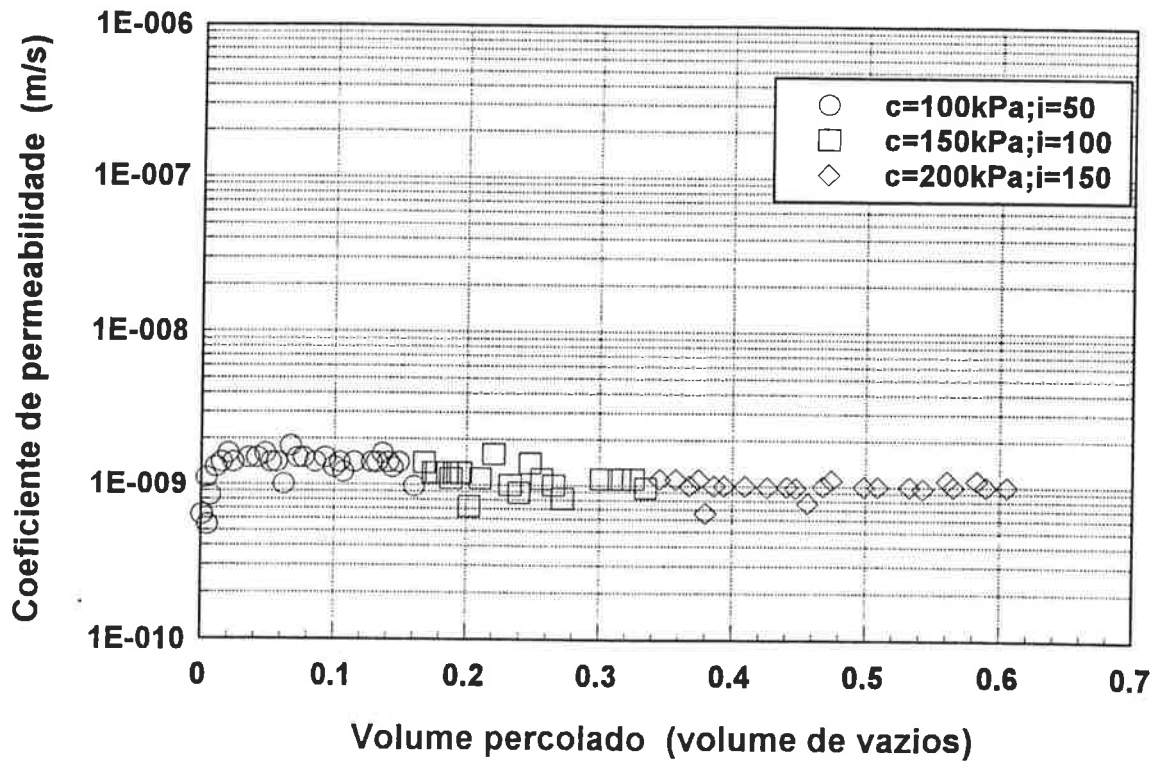
CP 4
GC=94,3% e $\Delta h=1,9\%$



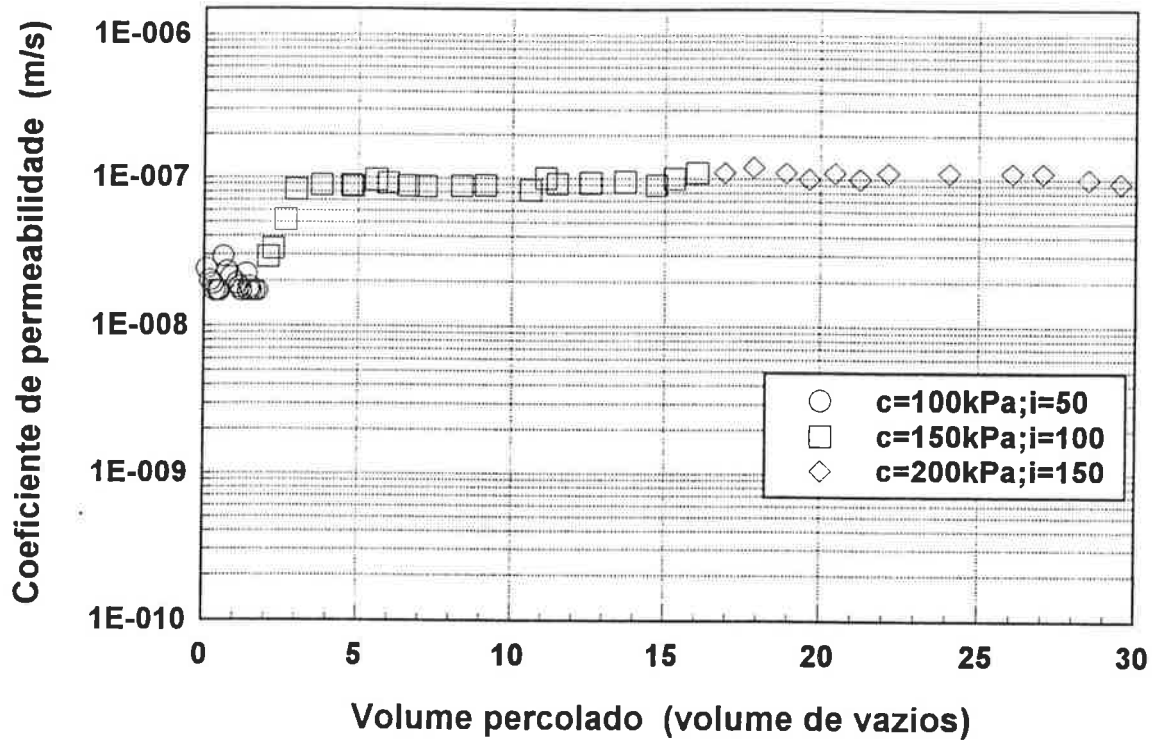
CP5

GC=98,2% e $\Delta h=1,2\%$ 

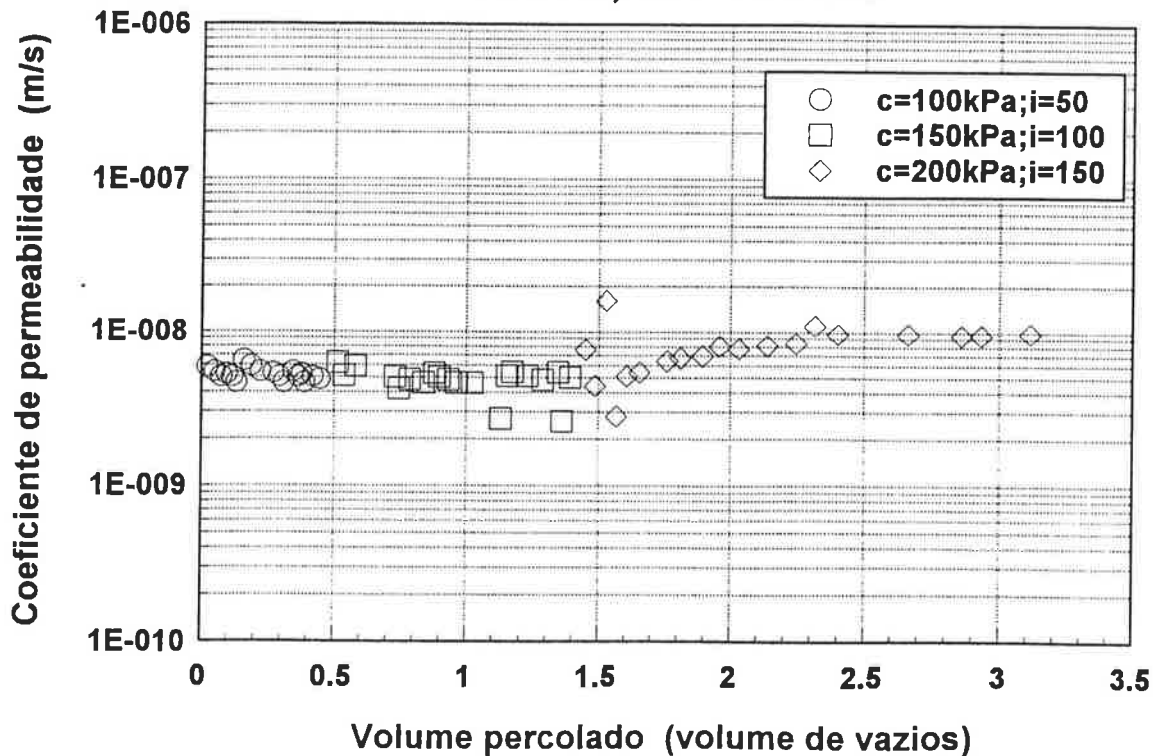
CP 6

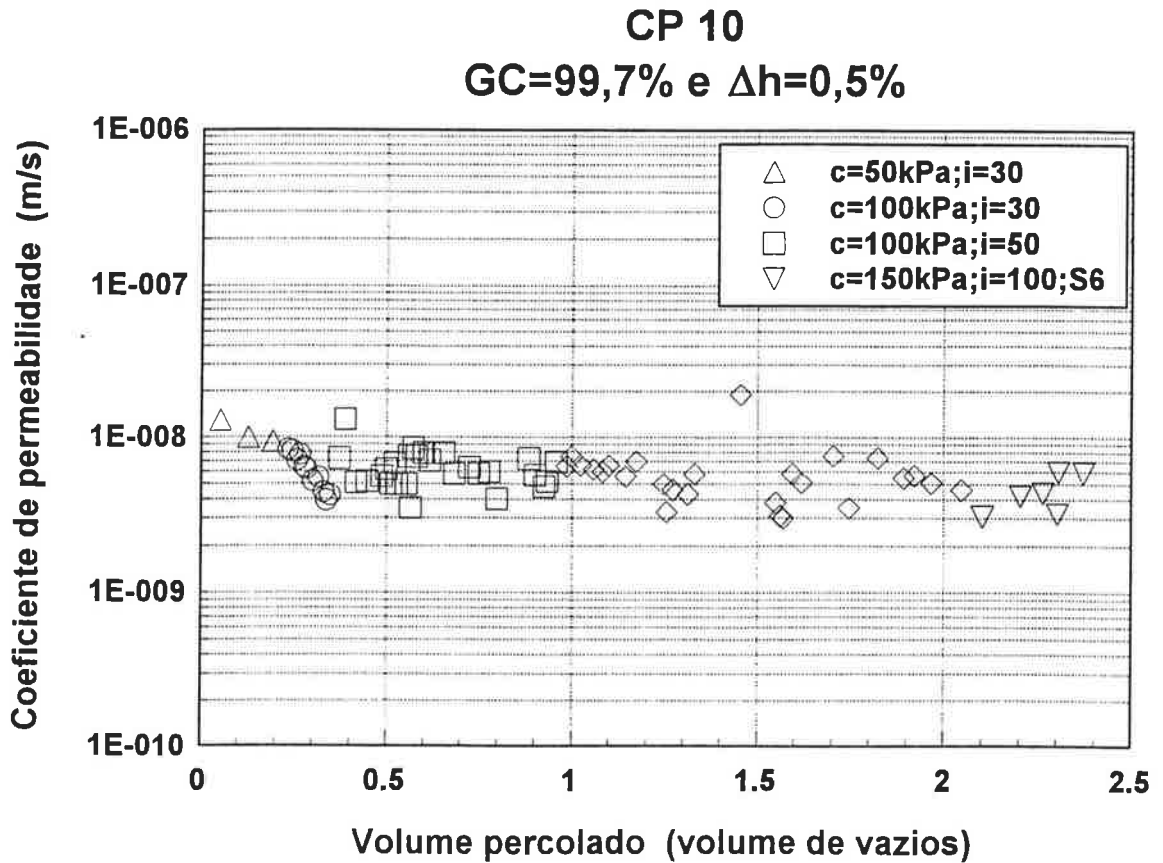
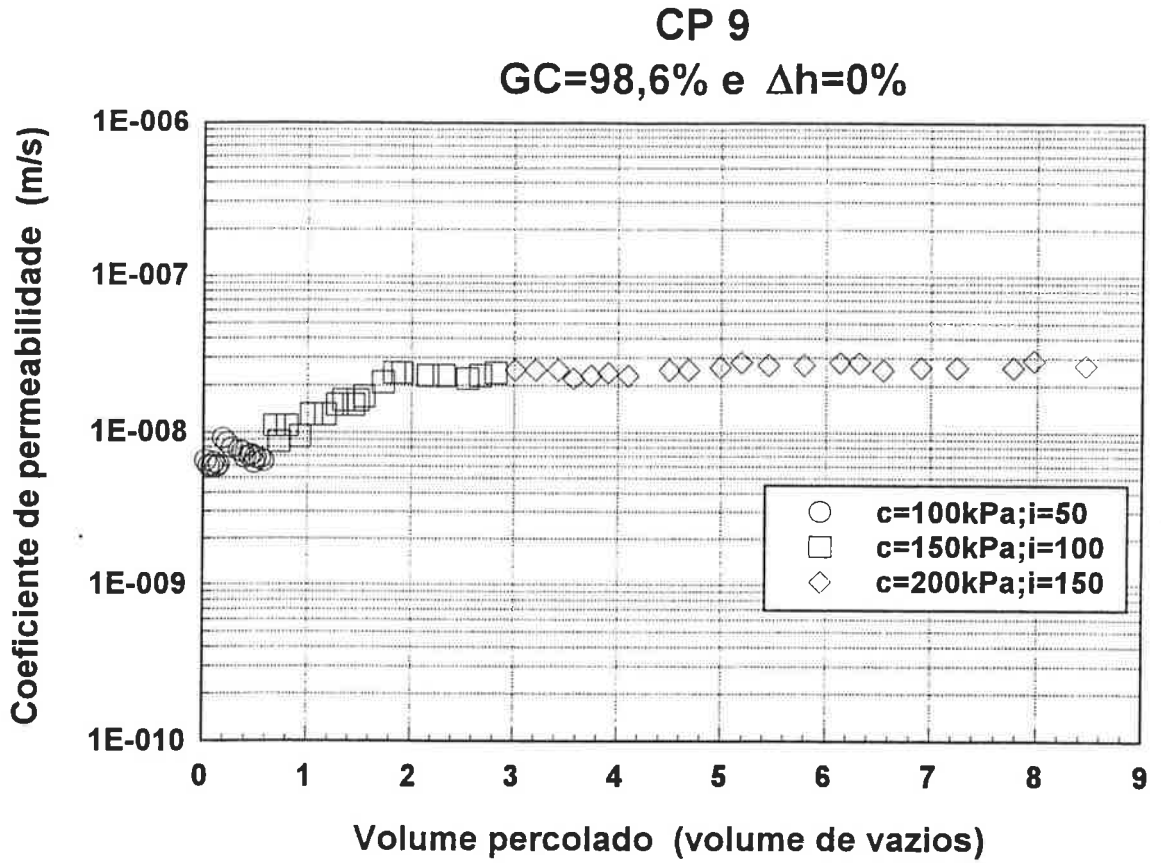
GC=99,1% e $\Delta h=1,2\%$ 

CP 7
GC=95,1% e $\Delta h=0\%$

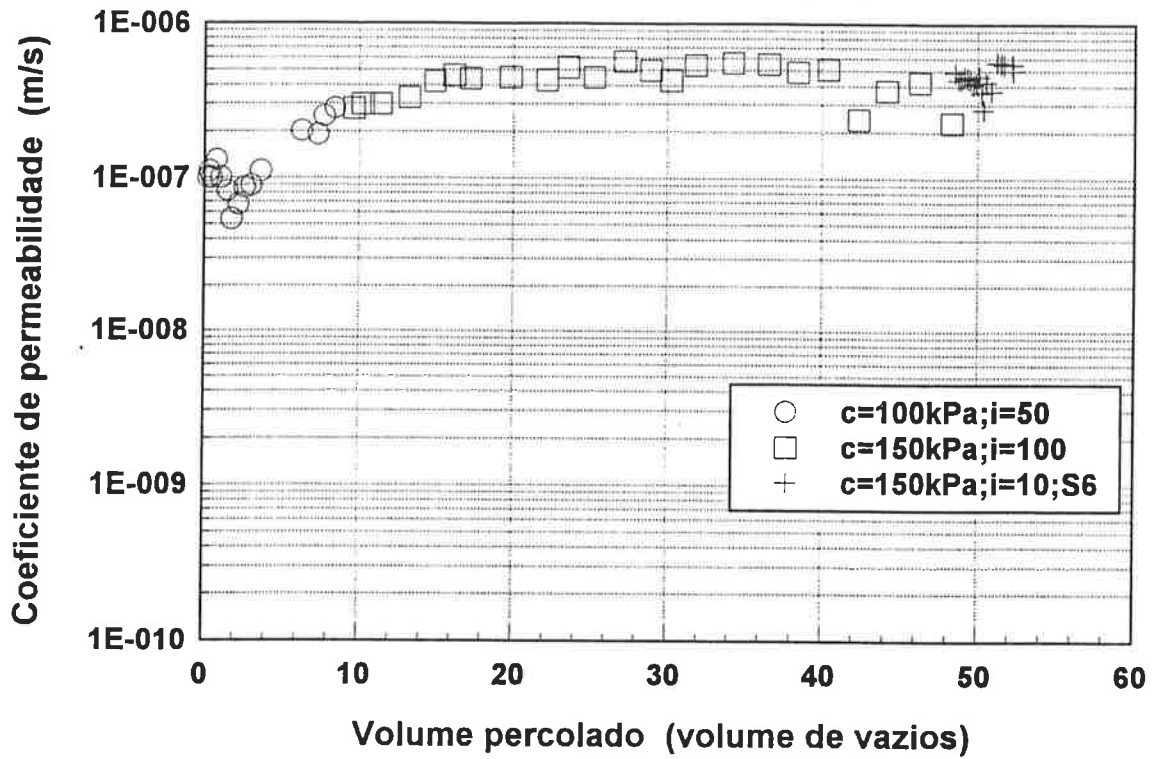


CP 8
GC=96,8% e $\Delta h=0\%$

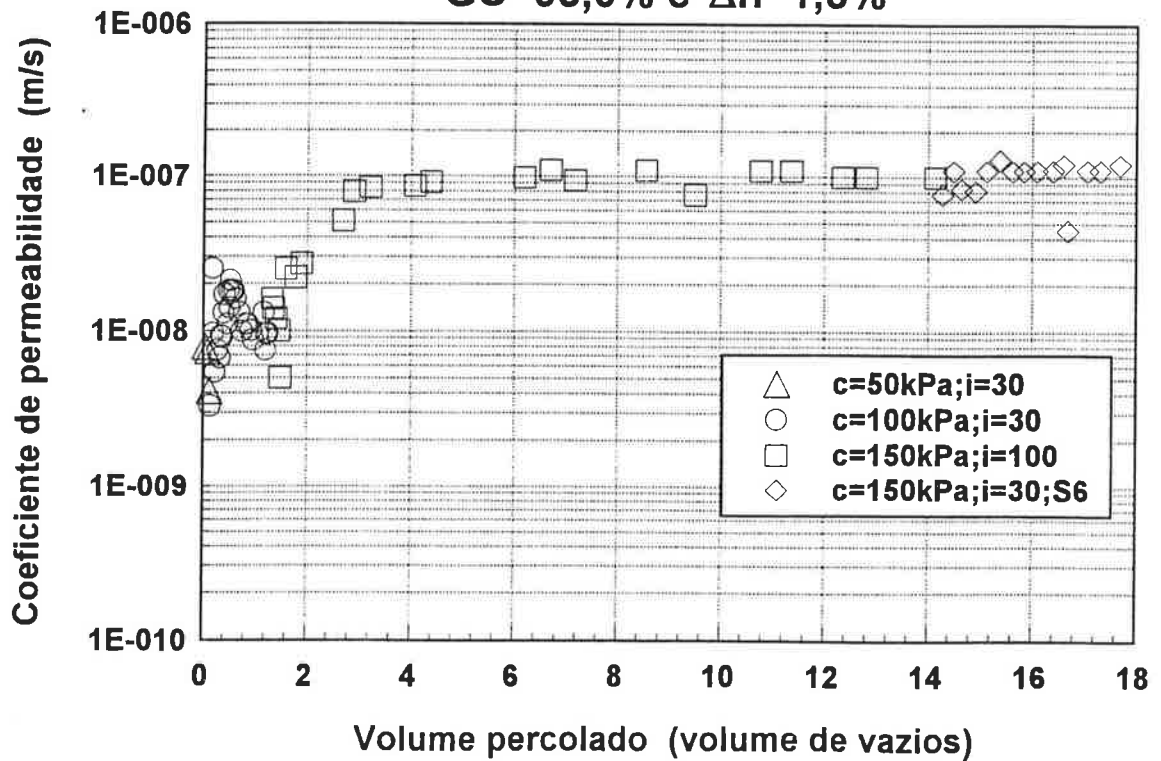




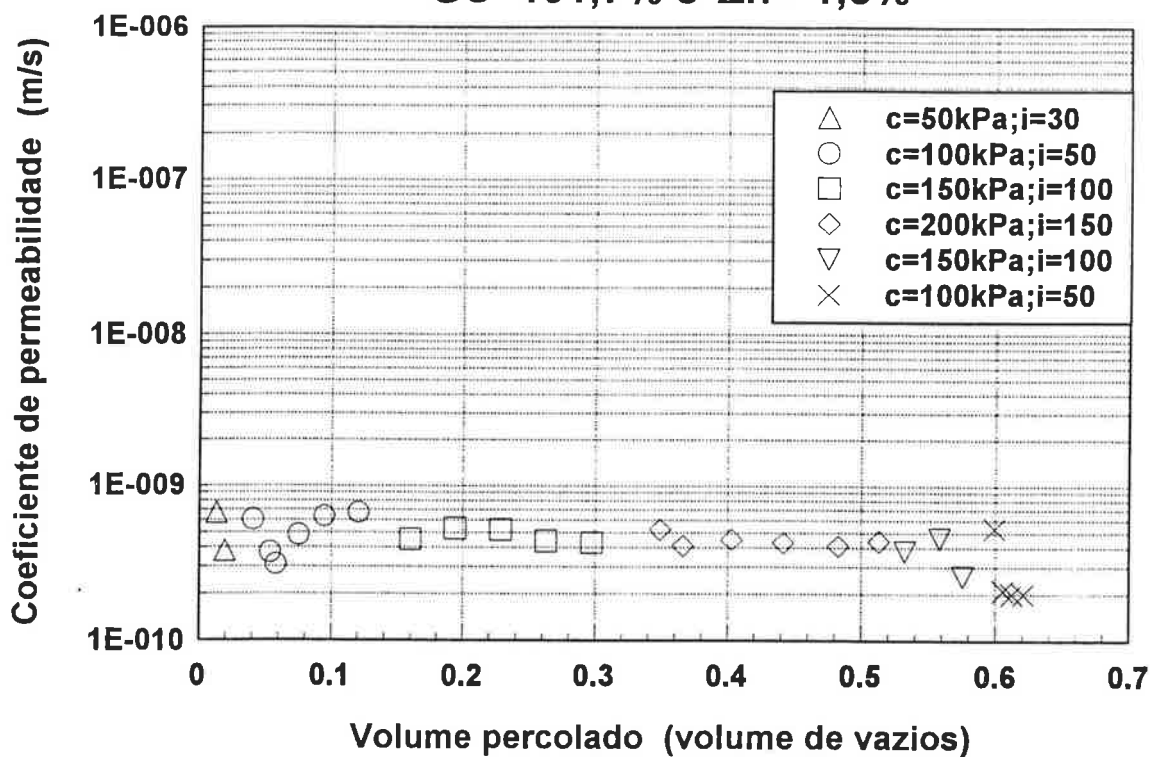
CP 11
GC=94,5% e $\Delta h=0,2\%$



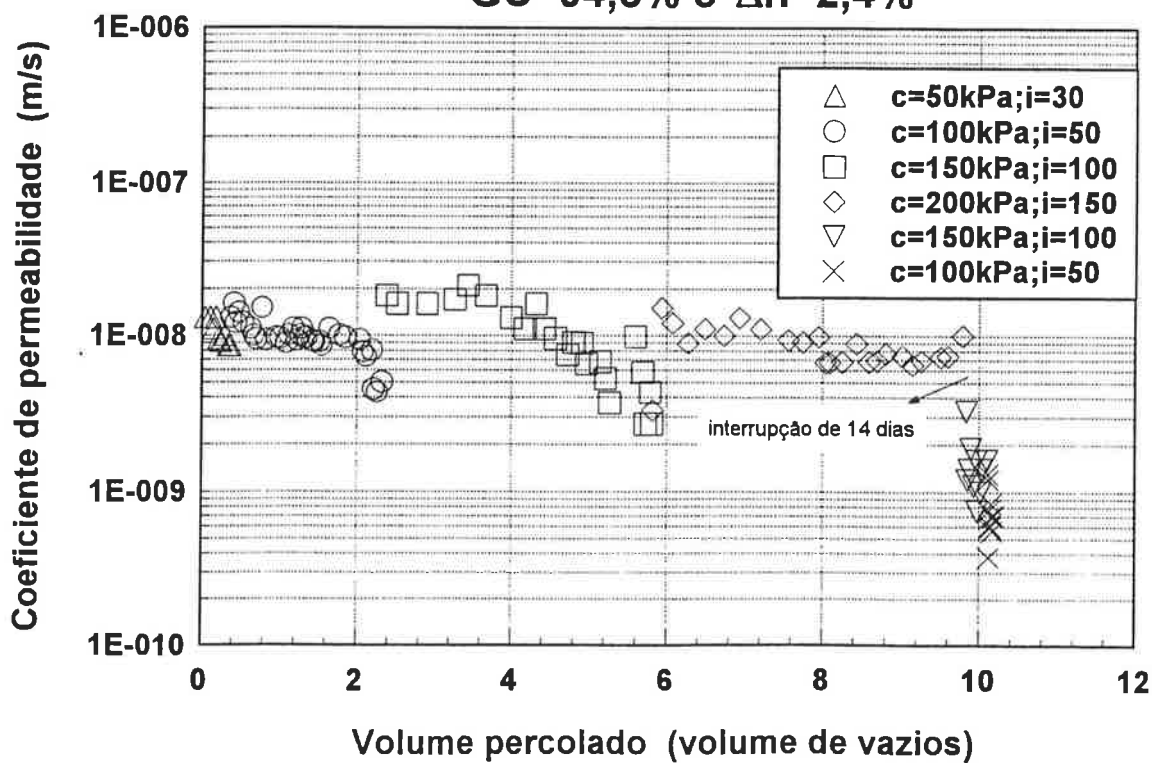
CP12
GC=95,0% e $\Delta h=1,8\%$



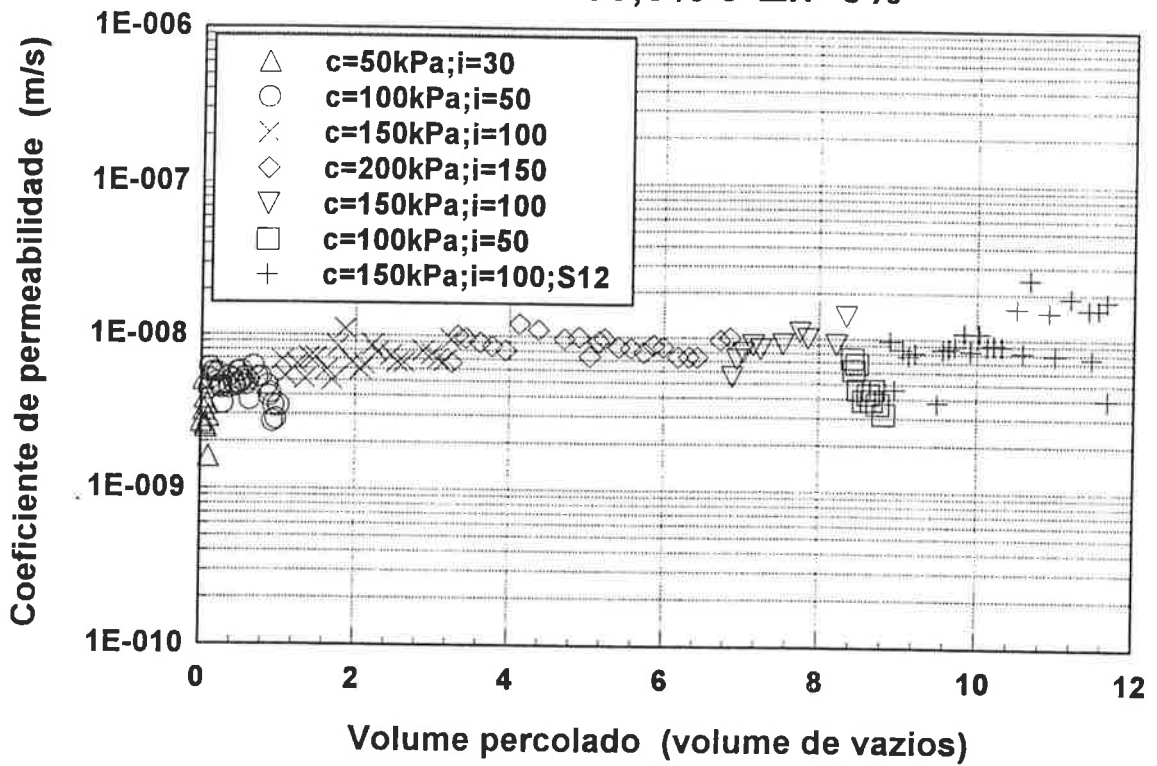
CP 13

GC=101,7% e $\Delta h=-1,8\%$ 

CP14

GC=94,5% e $\Delta h=2,4\%$ 

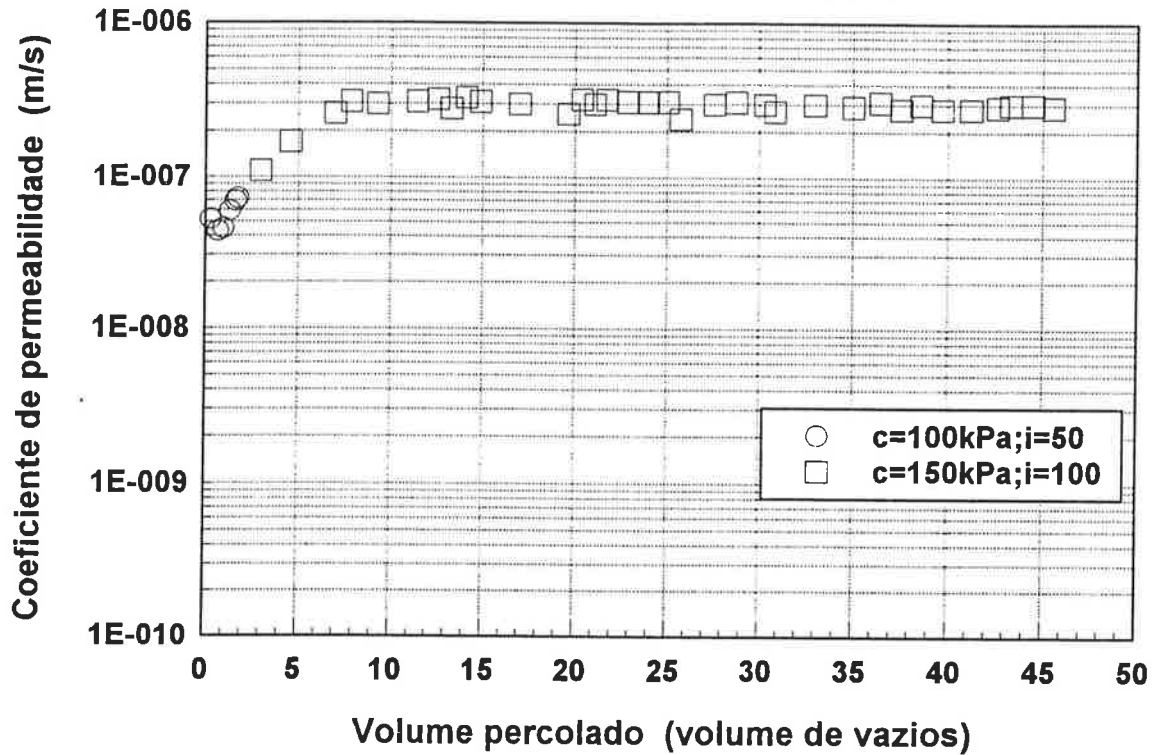
CP 15
GC=99,3% e $\Delta h=0\%$



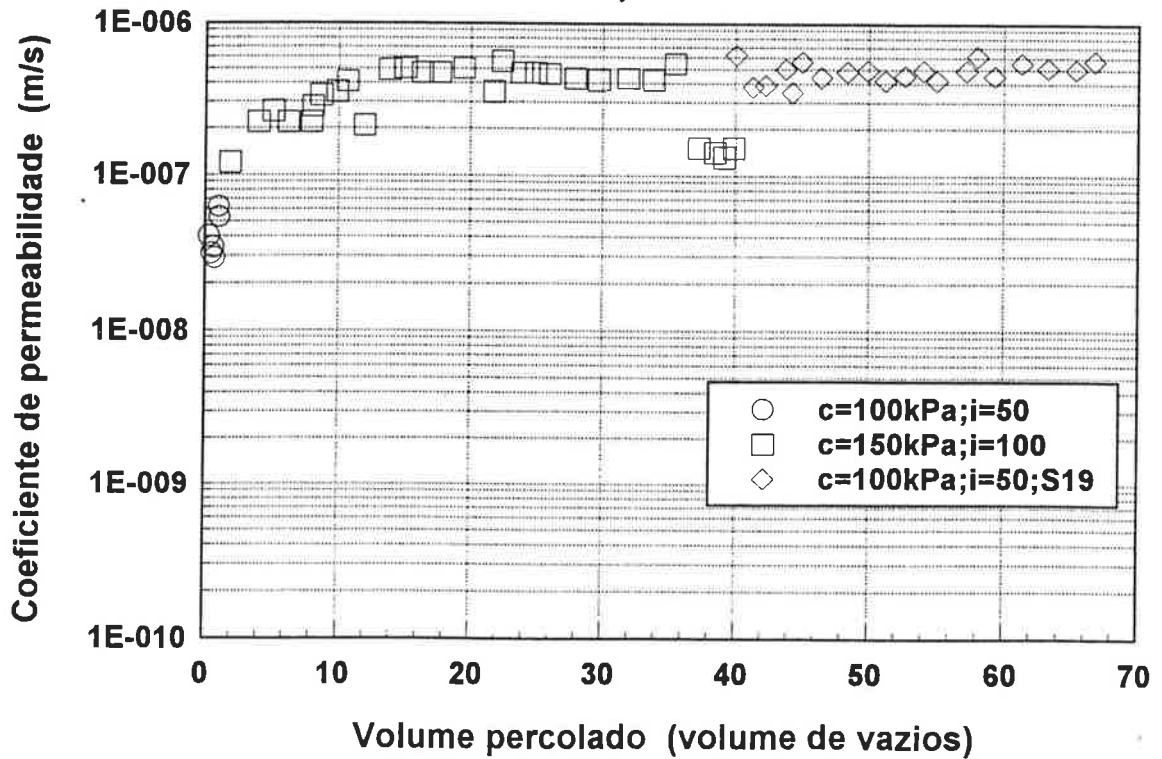
CP 16
GC=95,4% e $\Delta h=-2,5\%$



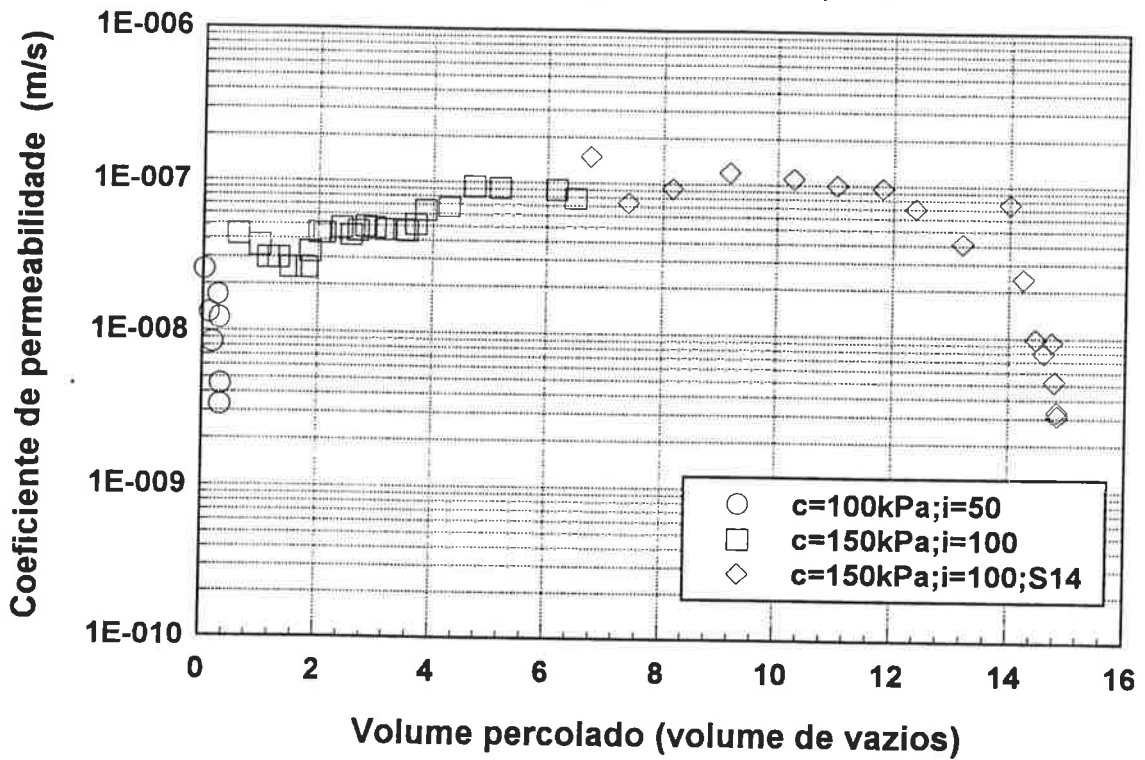
CP 17
GC=95,1% e $\Delta h=1,3\%$



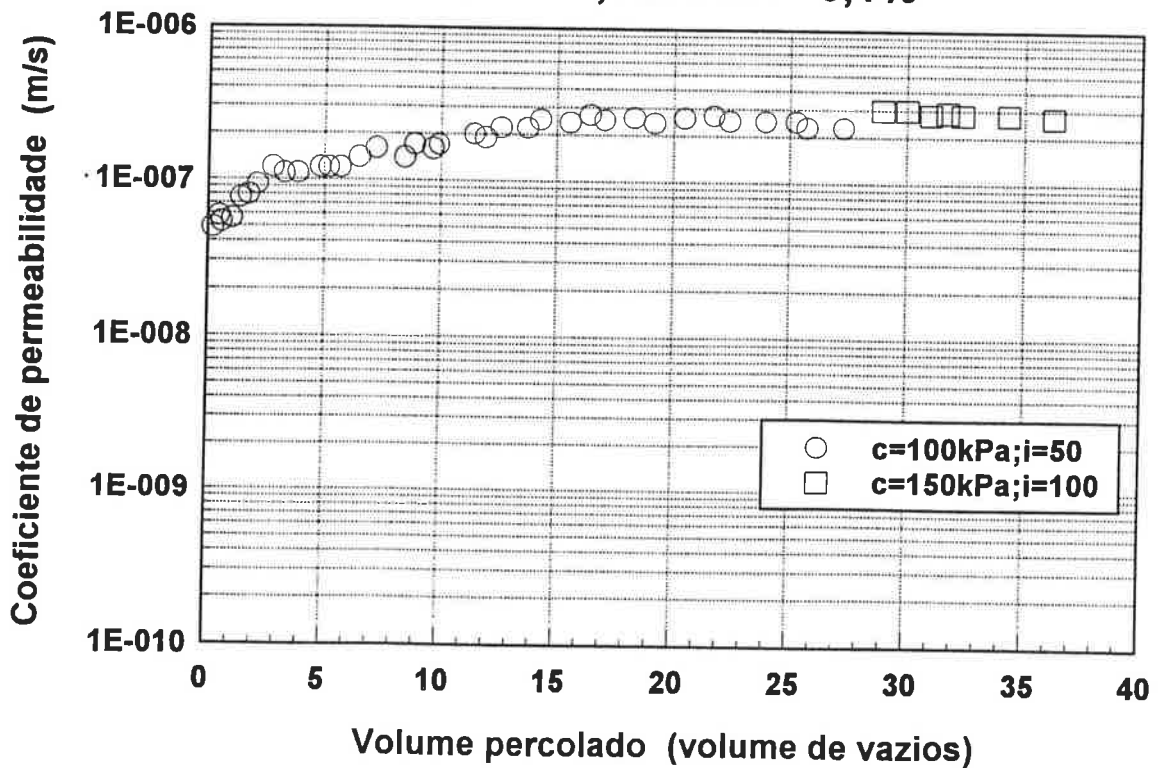
CP 18
GC=94,1% e $\Delta h=0\%$

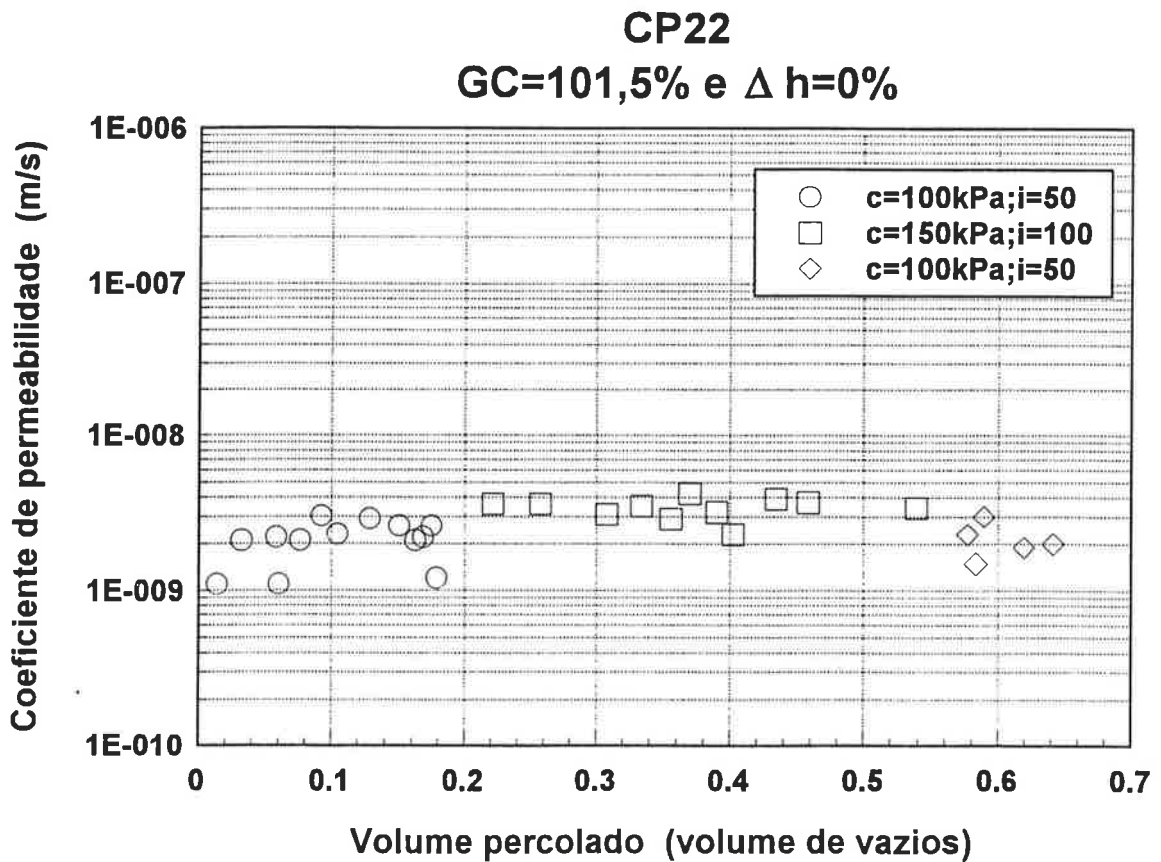
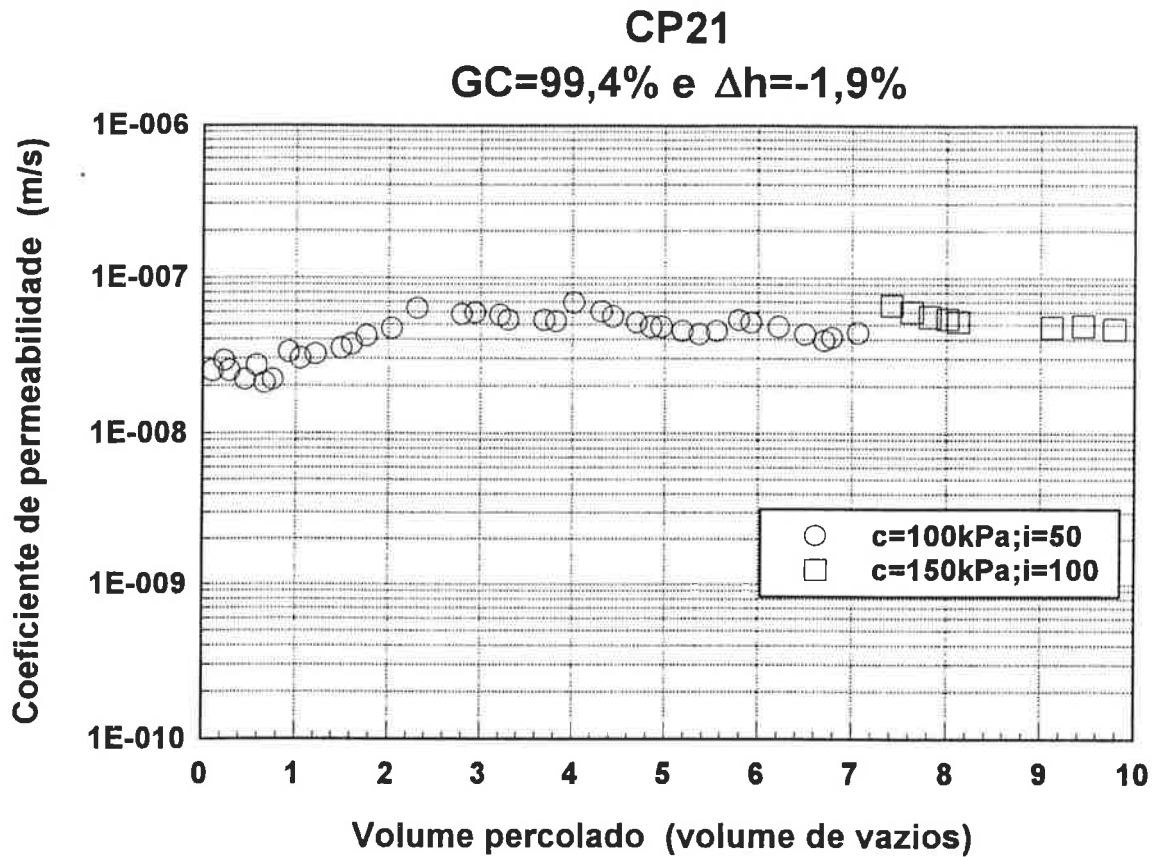


CP 19
GC=94,7% e $\Delta h=2,1\%$

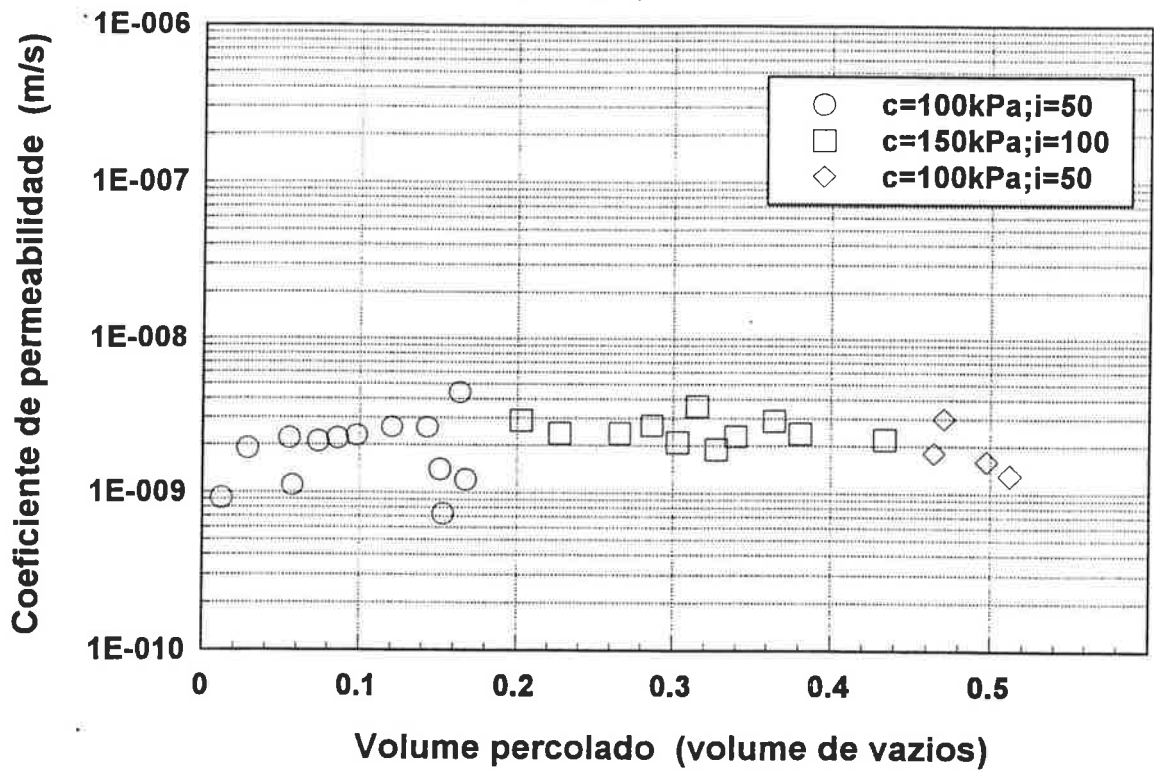


CP 20
GC=97,1% e $\Delta h=-0,1\%$

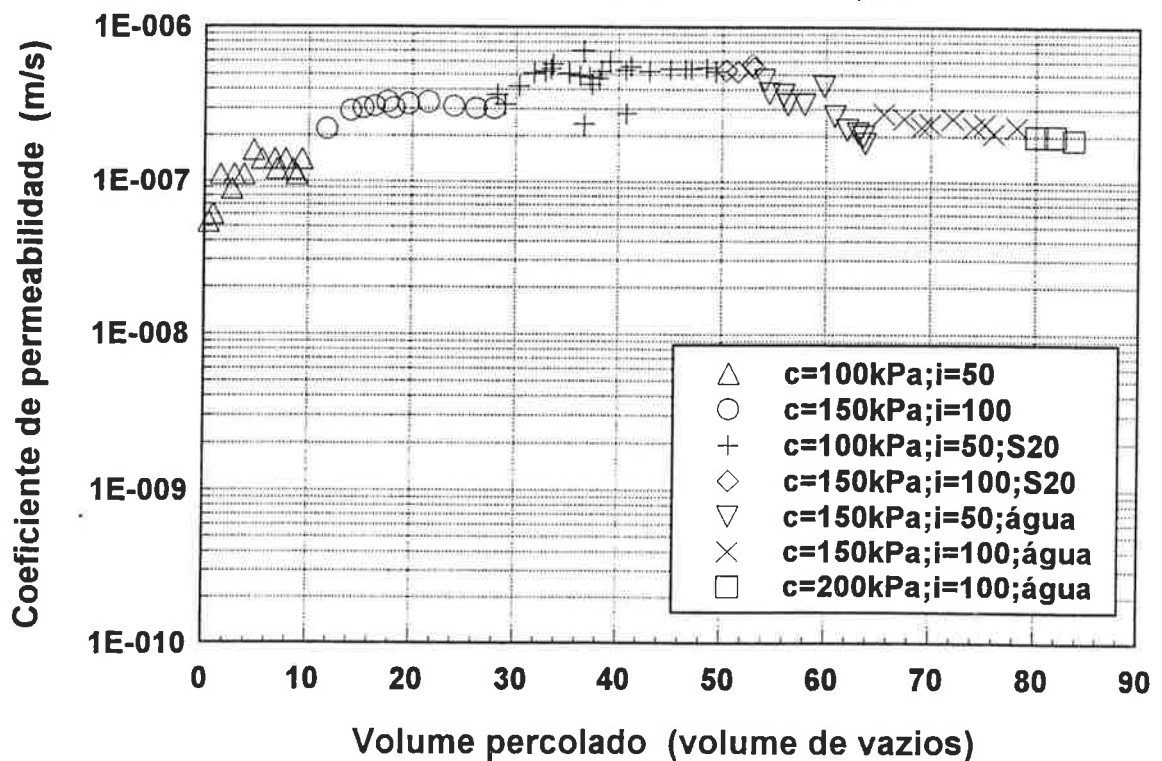




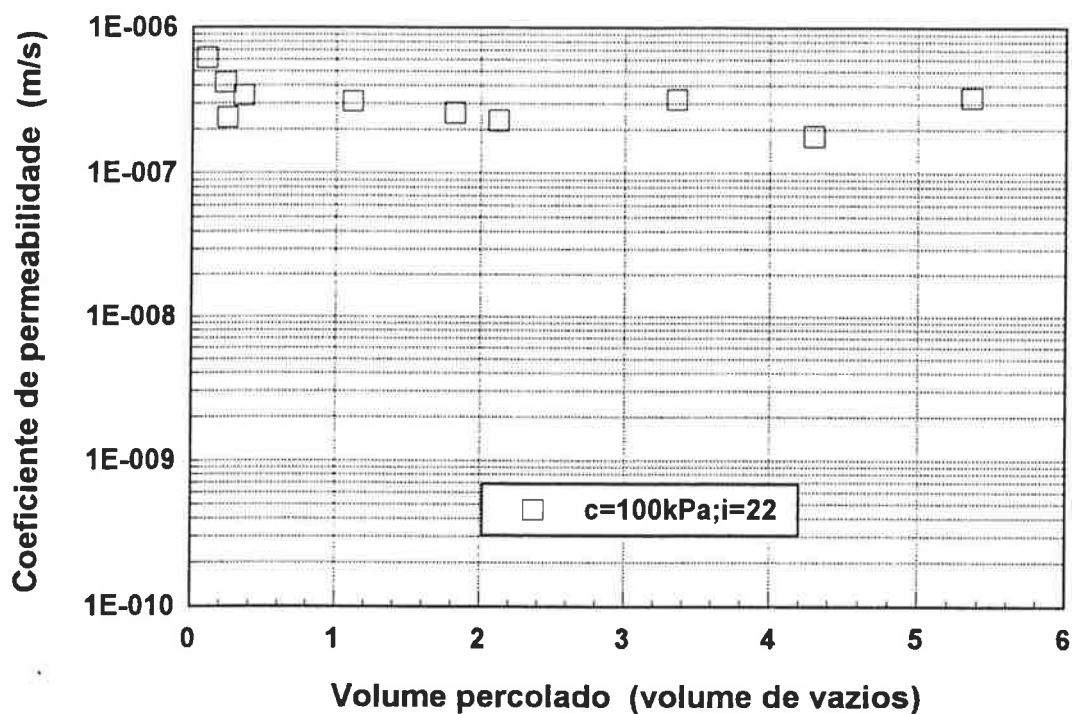
CP 23
GC=99,5% e $\Delta h=0\%$



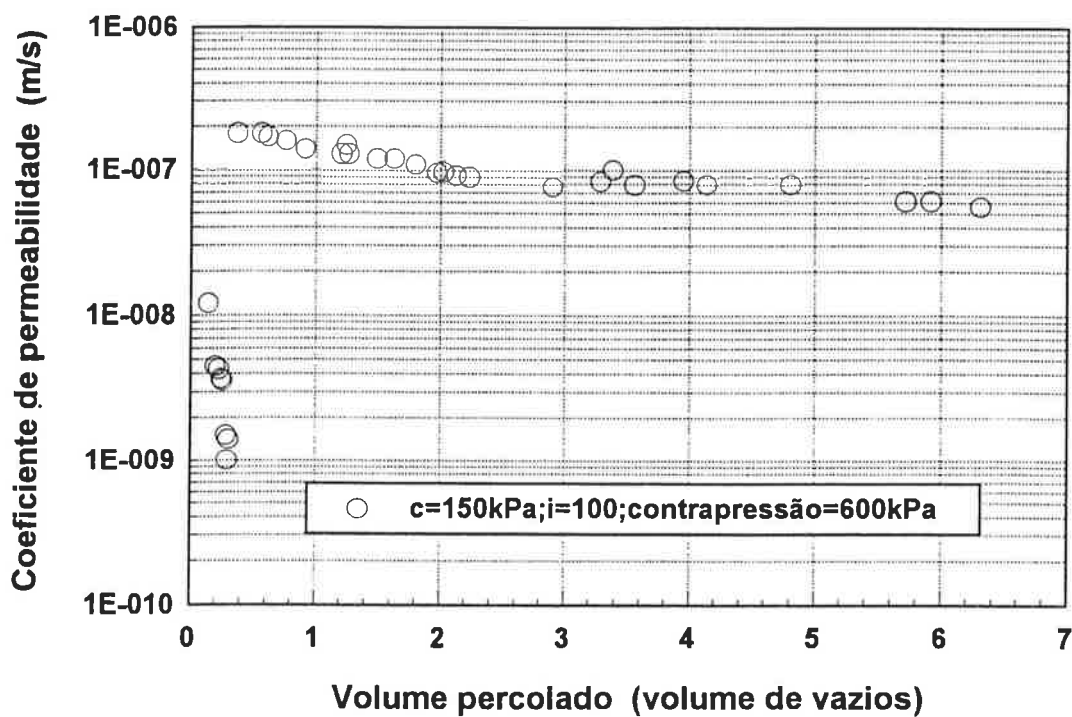
CP24
GC=95,9% e $\Delta h=-1,8\%$



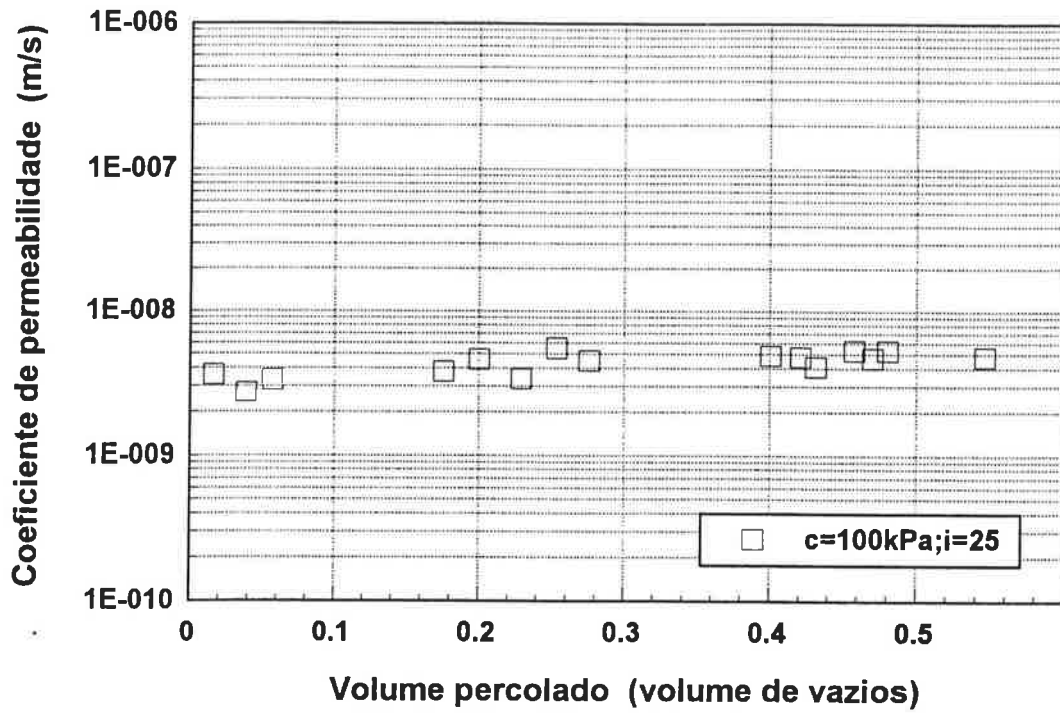
CP 25
GC=94,7% e $\Delta h=-1,6\%$



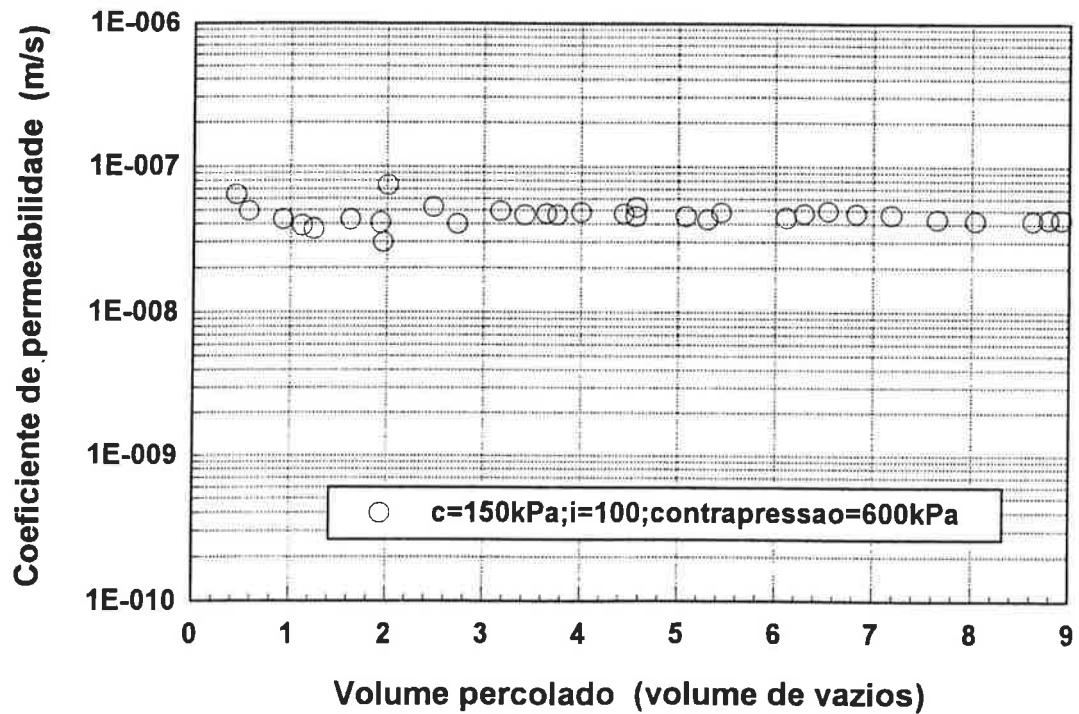
CP 25
GC=94,7% e $\Delta h=-1,6\%$



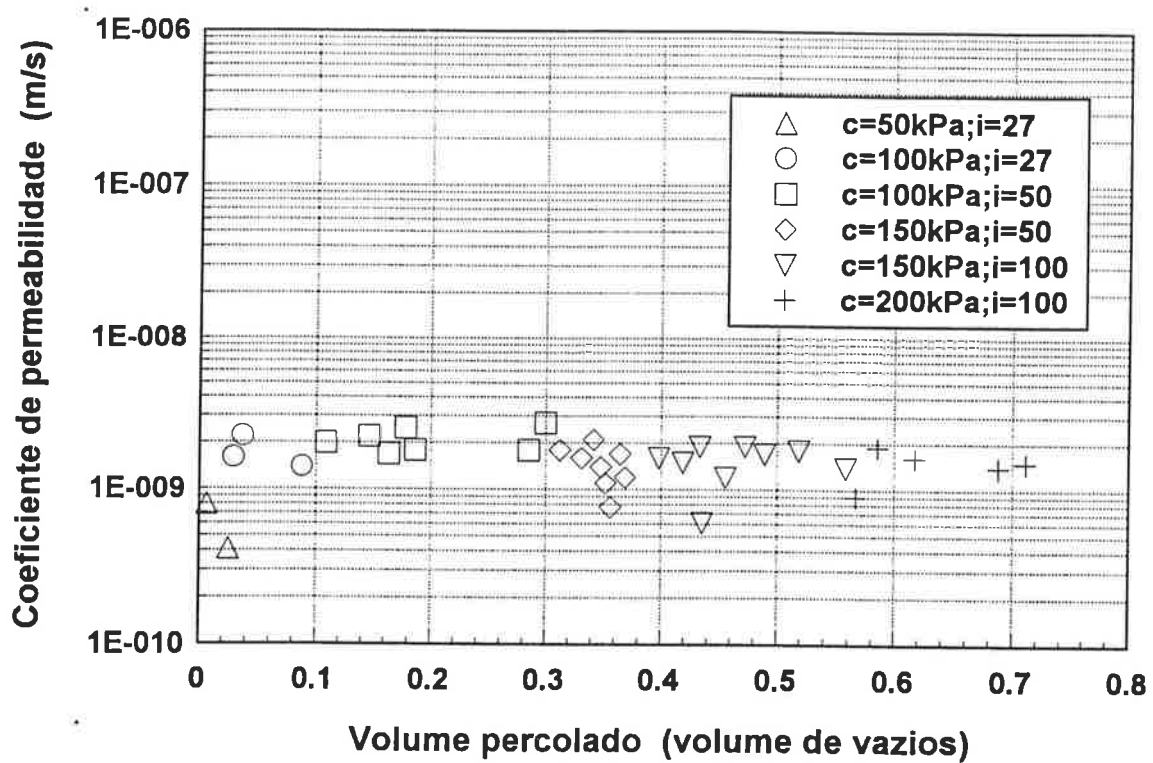
CP 26
GC=101,1% e $\Delta h=-1,3\%$



CP 26
GC=101,1% e $\Delta h=-1,3\%$



CP 27
GC=100,3% e $\Delta h=-0,1\%$



ANEXO H

DADOS DE MOLDAGEM DOS CORPOS-DE-PROVA DOS ENSAIOS DE DIFUSÃO

Corpo-de-prova	γ_s (kN/m ³)	h (%)	GC (%)	Δh (%)	e_i	e_r	s_i (%)	s_r (%)	Solução empregada	Tempo de difusão (dias)
1	14,68	26,4	100,2	-0,1	0,83		85,3	(96,6)	S1	12
2	14,70	26,4	100,3	-0,1	0,83		85,5	(96,0)	S2	12
3	13,93	28,3	95,1	1,8	0,93		81,9	(97,9)	S1	12
4	13,92	28,3	95,0	1,8	0,93		81,8	(98,8)	S2	12
5	14,72	27,0	100,5	0,5	0,83		87,8	(96,8)	S3	9
6	14,68	27,0	100,2	0,5	0,83		87,2	(95,2)	S4	10
7	13,84	28,3	94,5	1,8	0,94		80,8	(92,8)	S3	10
8	13,83	28,3	94,4	1,8	0,94		80,7	(98,9)	S4	10
9	14,54	26,4	99,2	-0,1	0,85		83,6	(92,7)	S5	3
10	14,61	26,4	99,7	-0,1	0,84		84,5	(93,4)	S5	5
11	14,63	26,4	99,9	-0,1	0,84		84,8	(95,0)	S5	7
12	14,84	26,4	101,3	-0,1	0,81		87,4	(98,0)	S5	10
13	14,04	26,3	95,8	-0,2	0,92		77,3	(92,0)	S6	5
14	13,97	28,3	95,4	1,8	0,93		82,2	(91,5)	S6	5
15	14,39	26,3	98,2	-0,2	0,87		81,5	(96,8)	S6	5
16	14,57	28,3	99,5	1,8	0,85		89,9	(96,1)	S6	5
17	14,87	26,5	101,5	0,0	0,81	0,80	88,2	100,0	S7	4
18	14,79	26,6	101,0	0,0	0,82	0,81	87,2	100,0	S8	4
19	14,83	26,5	101,3	0,0	0,81	0,81	87,7	100,0	S9	4
20	14,82	26,5	101,1	0,0	0,82	0,82	87,5	100,0	S10	4
21	13,97	26,5	95,3	0,0	0,93	0,92	77,0	92,8	S11	7
22	14,10	28,8	96,2	2,3	0,91	0,92	85,4	97,4	S11	7
23	14,16	24,1	96,6	-2,4	0,90	0,91	72,0	99,0	S11	7
24	14,49	26,5	98,9	0,0	0,86	0,87	83,3	96,4	S11	7
25	14,80	26,4	101,0	-0,1	0,82	0,82	87,0	97,7	S13	11

DADOS DE MOLDAGEM DOS CORPOS-DE-PROVA DOS ENSAIOS DE DIFUSÃO - CONTINUAÇÃO

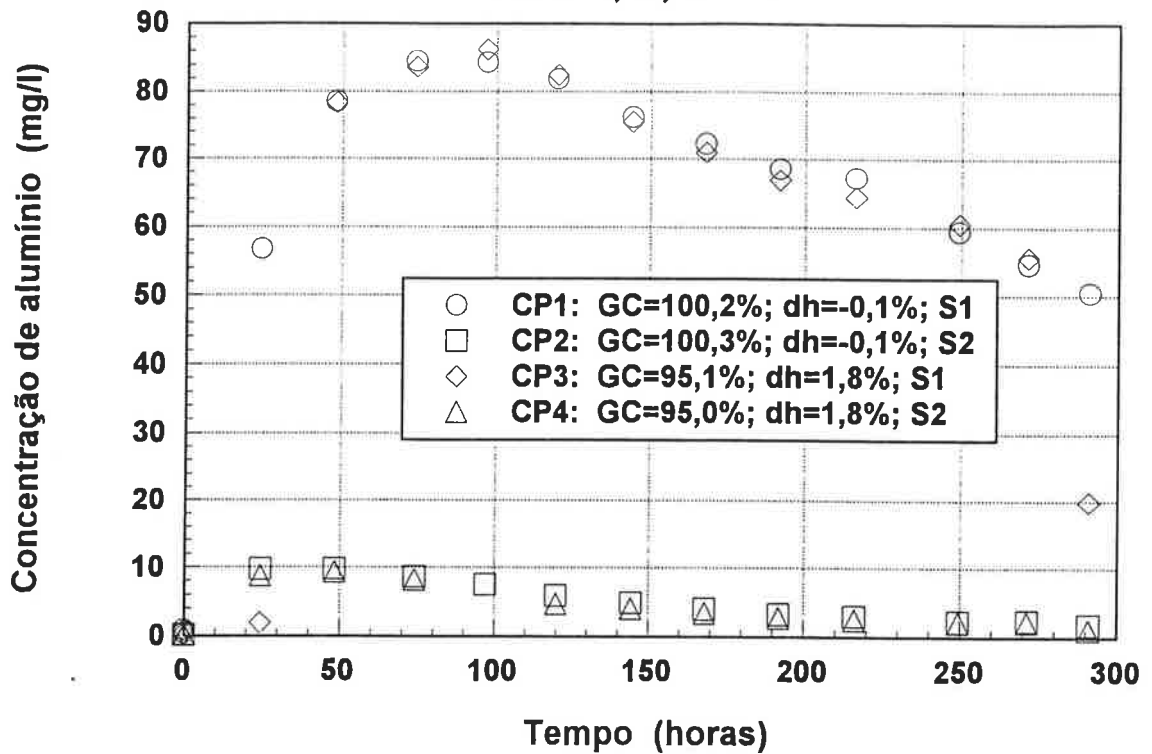
Corpo-de-prova	γ_s (kN/m ³)	h (%)	GC (%)	Δh (%)	e_i	e_f	s_i (%)	s_f (%)	Solução empregada	Tempo de difusão (dias)
26	14,11	28,6	96,3	2,1	0,91	0,90	84,9	95,9	S13	11
27	14,03	24,6	95,8	-1,9	0,92	0,91	72,1	97,7	S13	11
28	15,14	26,4	103,3	-0,1	0,78	0,77	91,6	100,0	S13	11
29	14,81	26,4	101,1	-0,1	0,82	0,82	87,1	94,7	S15	10
30	14,66	26,4	100,1	-0,1	0,83	0,83	85,2	95,4	S16	10
31	14,76	26,4	100,8	-0,1	0,82	0,82	86,5	96,2	S17	10
32	14,81	26,4	101,1	-0,1	0,82	0,82	87,1	97,9	S18	10
Branco	14,67	26,7	100,2	0,2	0,83	0,83	86,1	95,4	H ₂ O dest.	4

ANEXO I

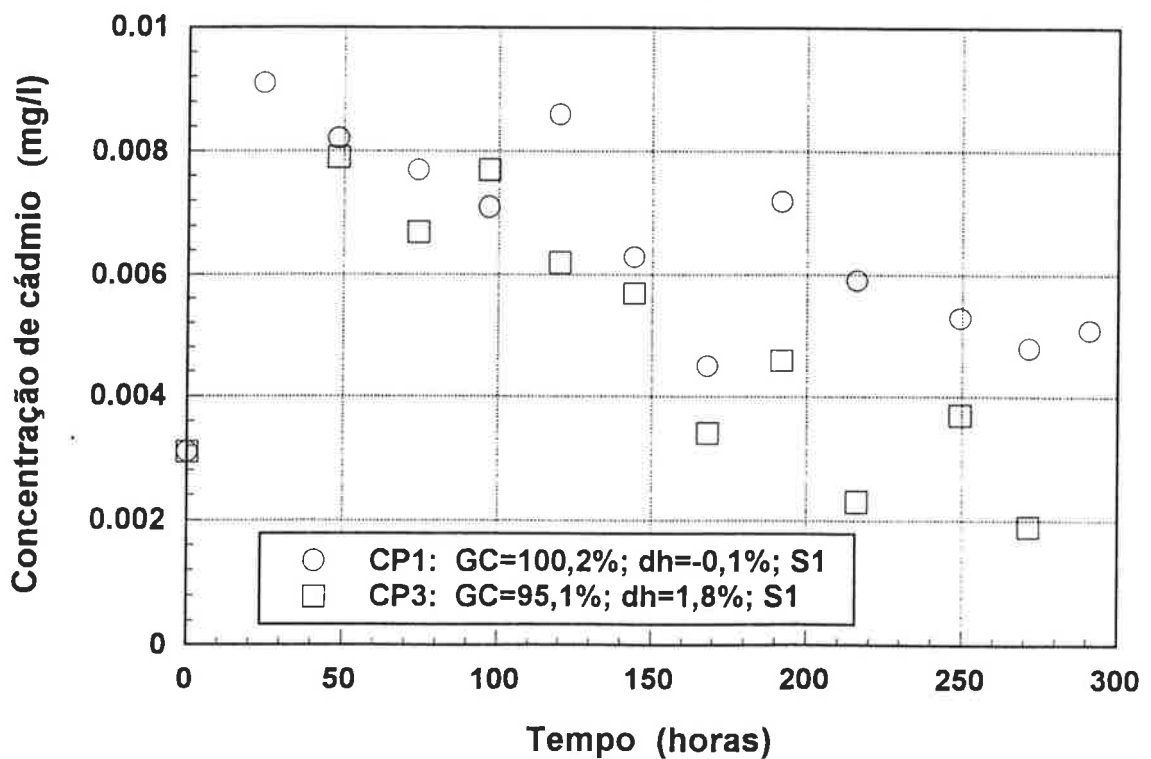
RESULTADOS DOS ENSAIOS DE DIFUSÃO

CONCENTRAÇÃO NO FLUIDO DO RESERVATÓRIO EM FUNÇÃO DO TEMPO DE ENSAIO

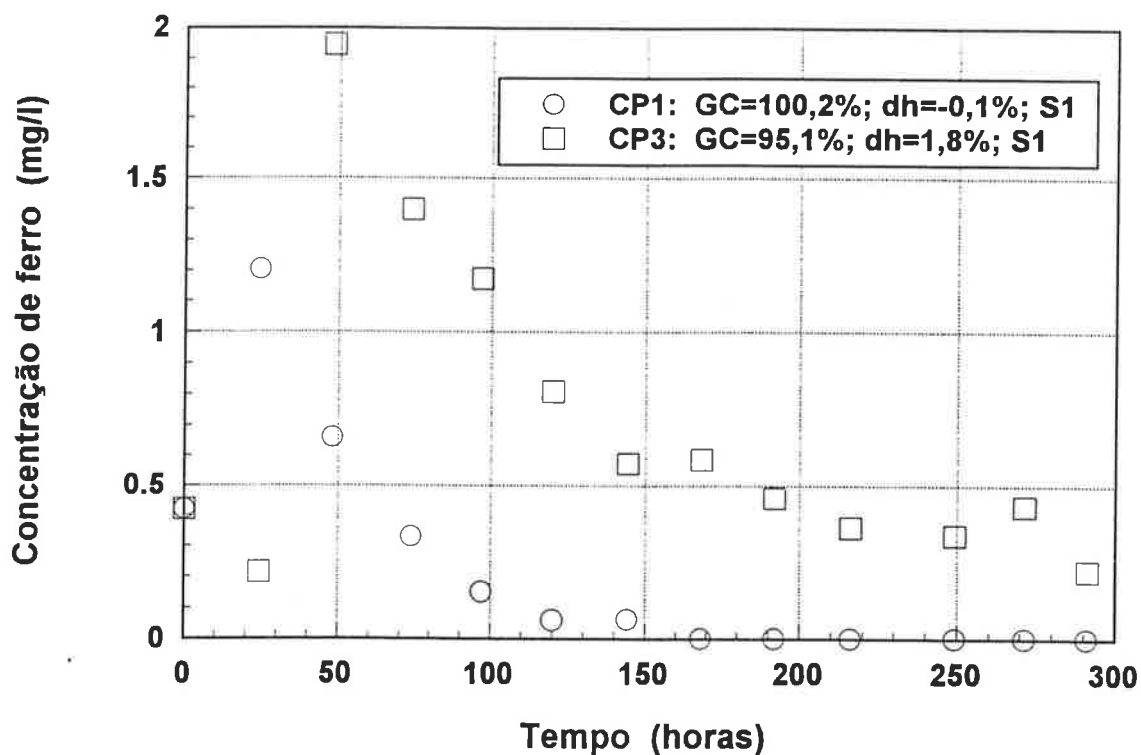
Concentração de alumínio no reservatório CPs 1, 2, 3 e 4



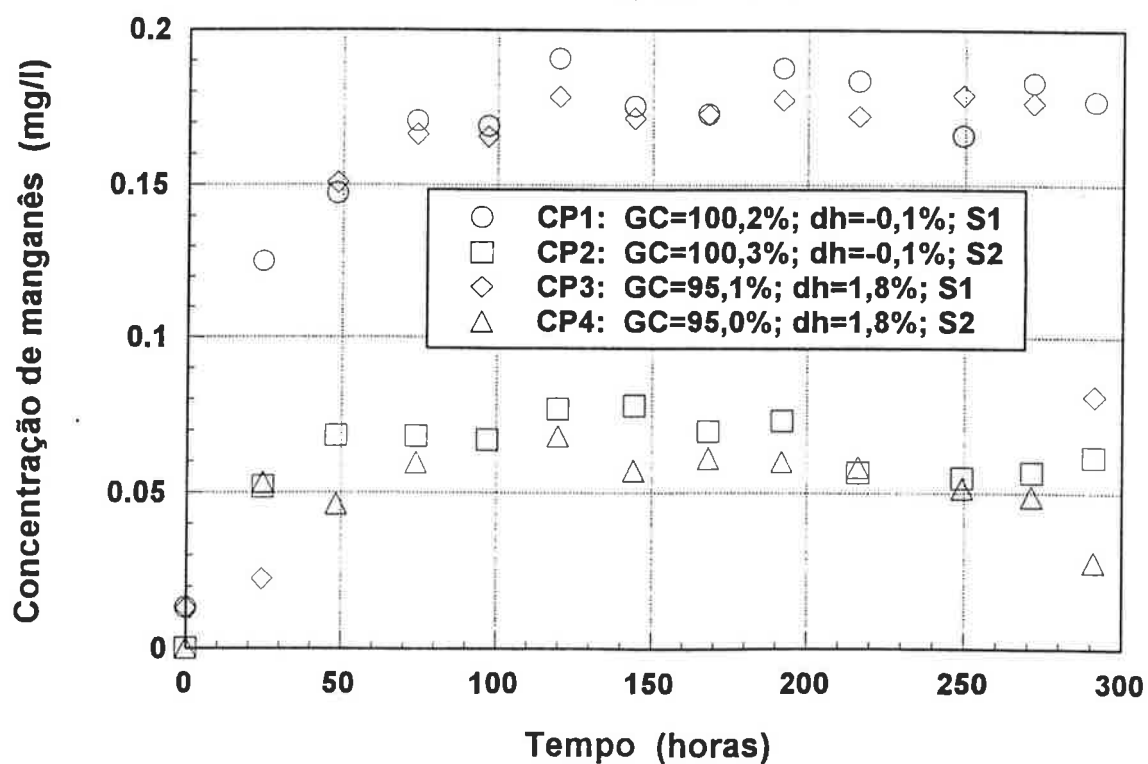
Concentração de cádmio no reservatório CPs 1 e 3



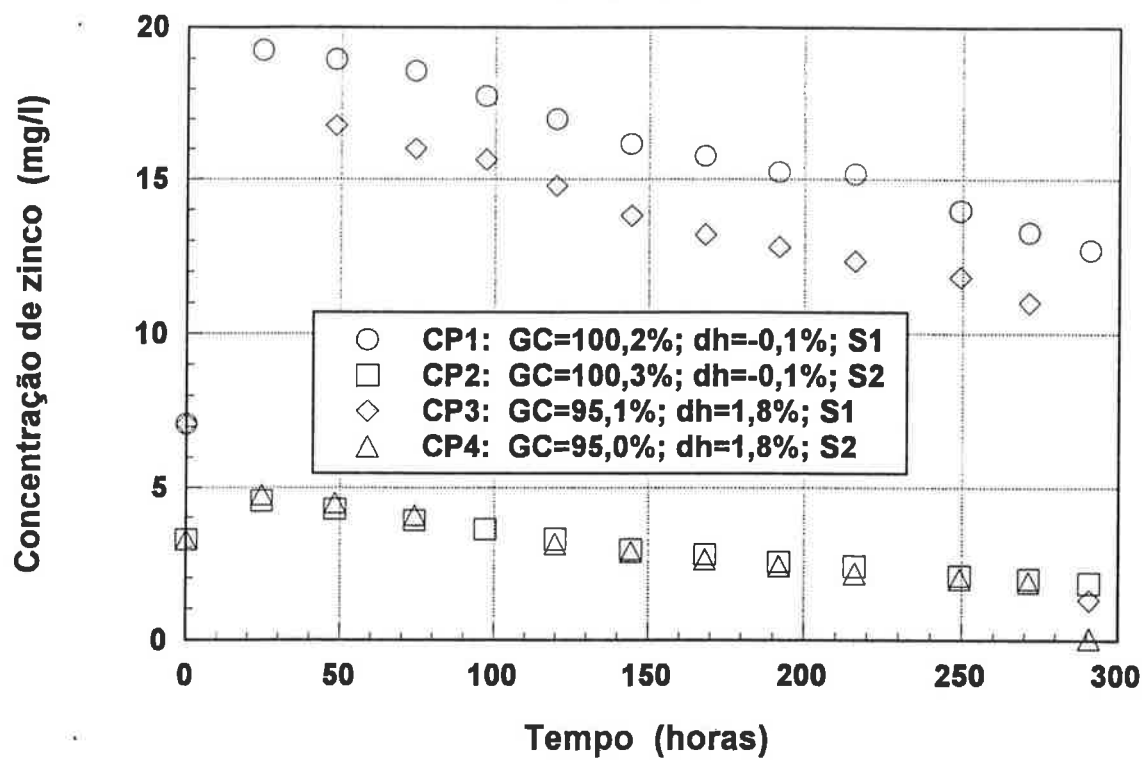
Concentração de ferro no reservatório CPs 1 e 3



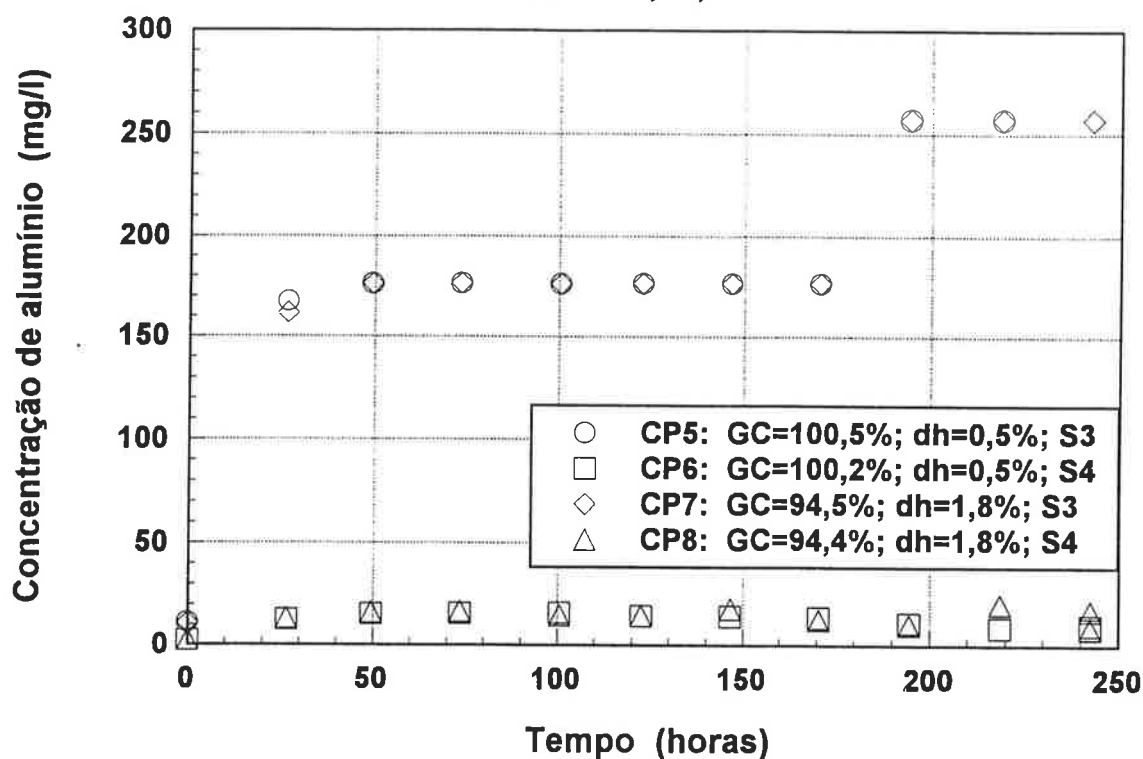
Concentração de manganês no reservatório CPs 1, 2, 3 e 4



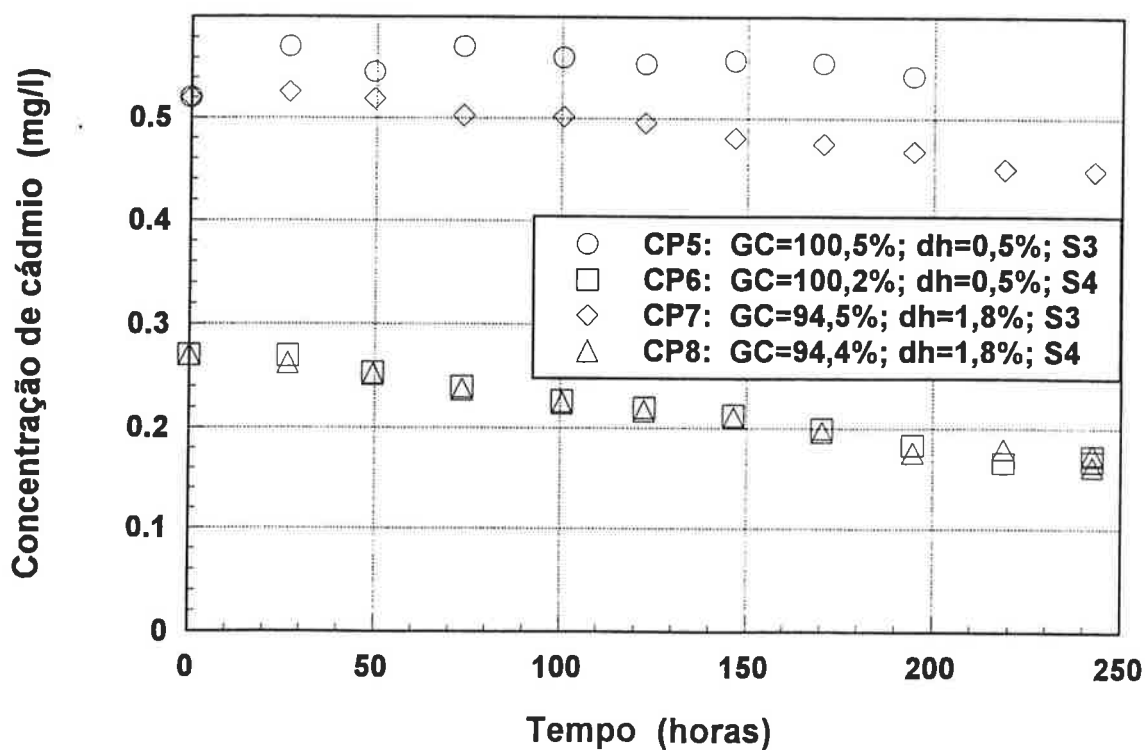
Concentração de zinco no reservatório CPs 1, 2, 3 e 4



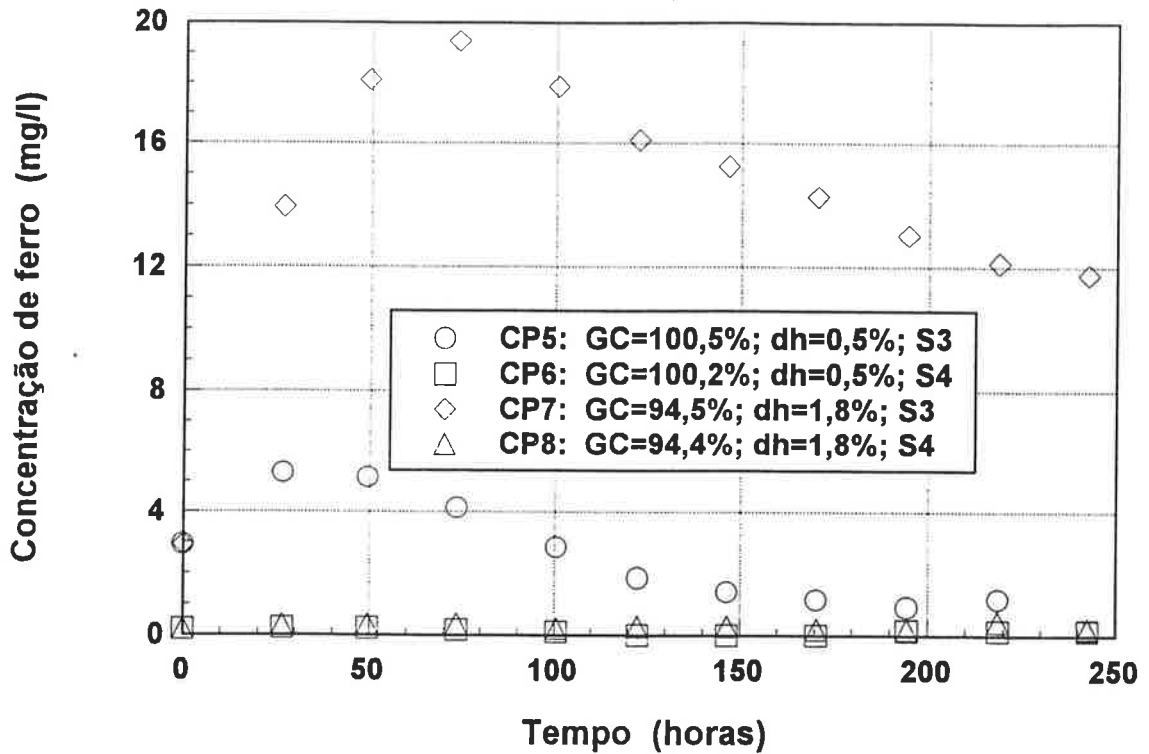
Concentração de alumínio no reservatório CPs 5, 6, 7 e 8



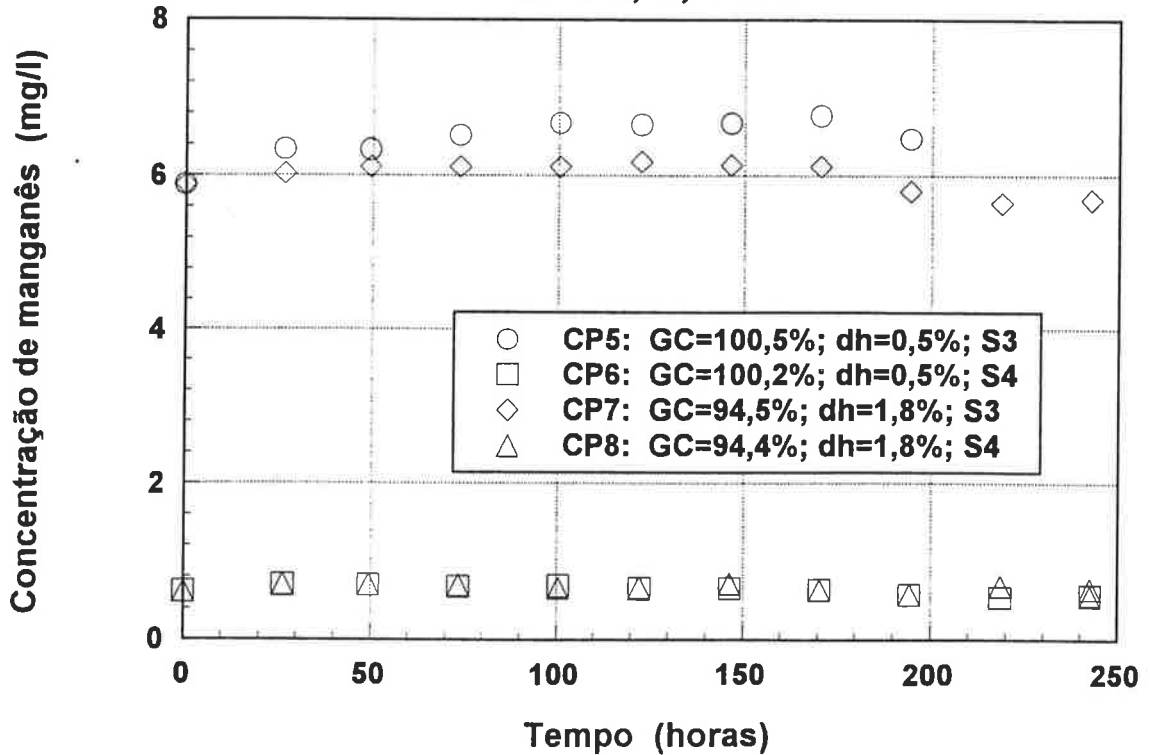
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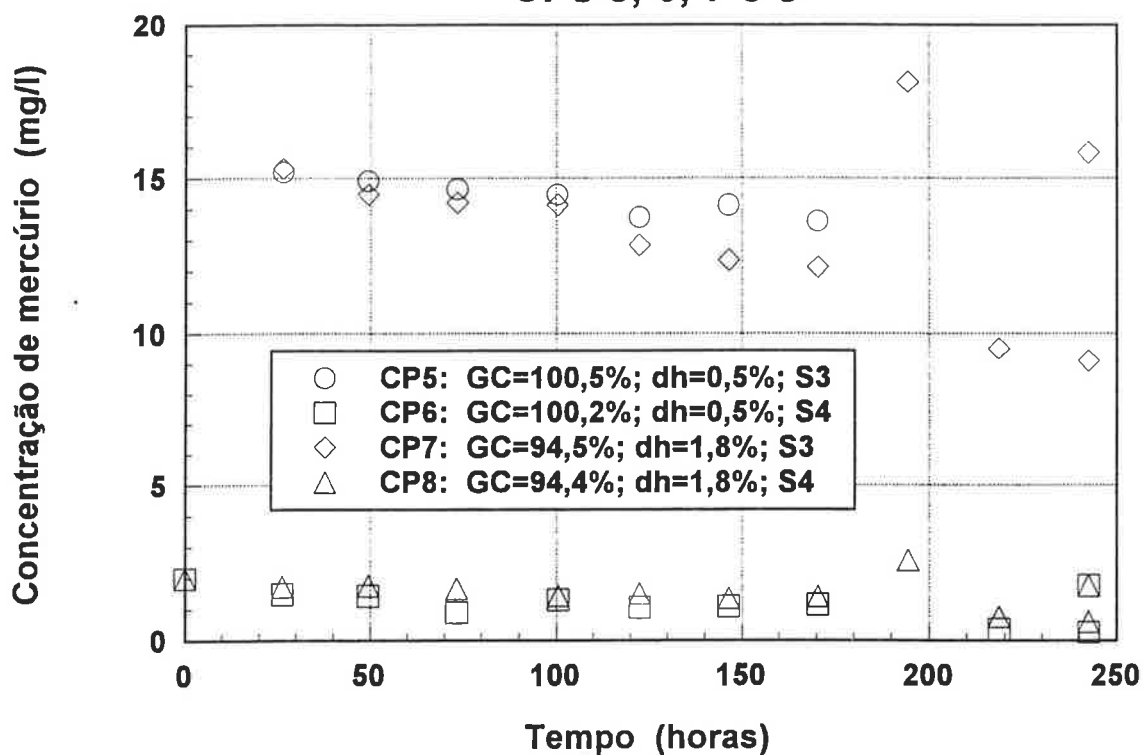
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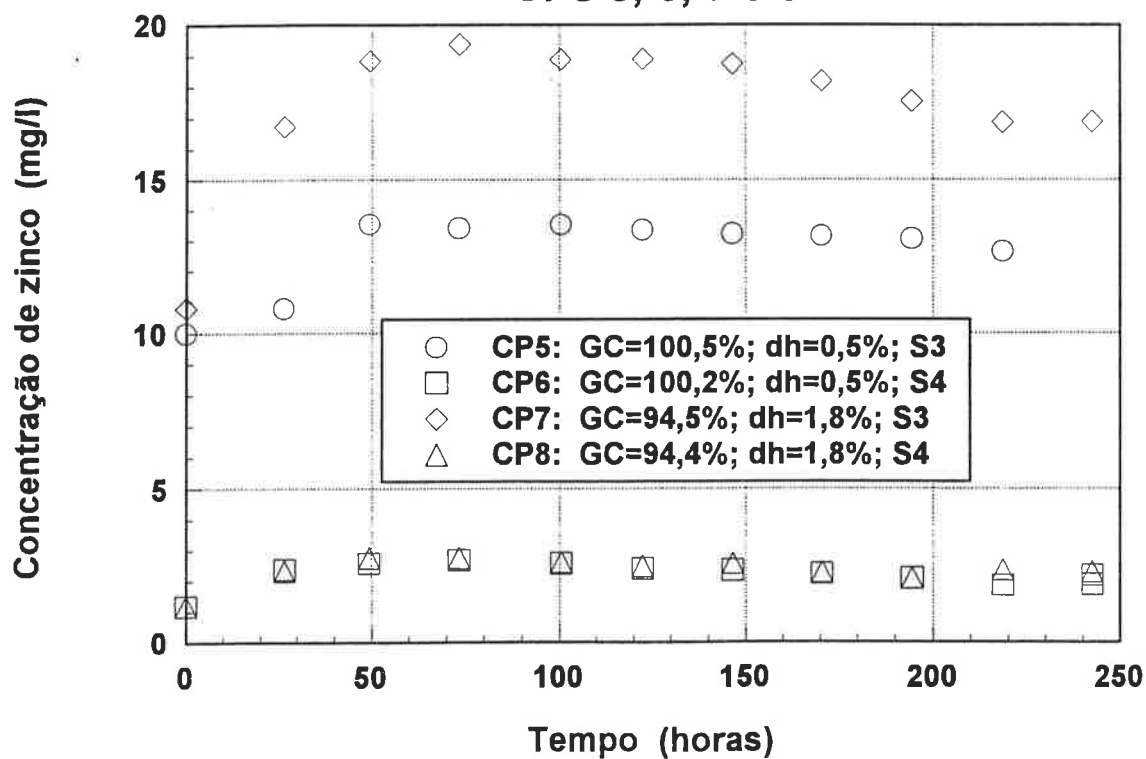
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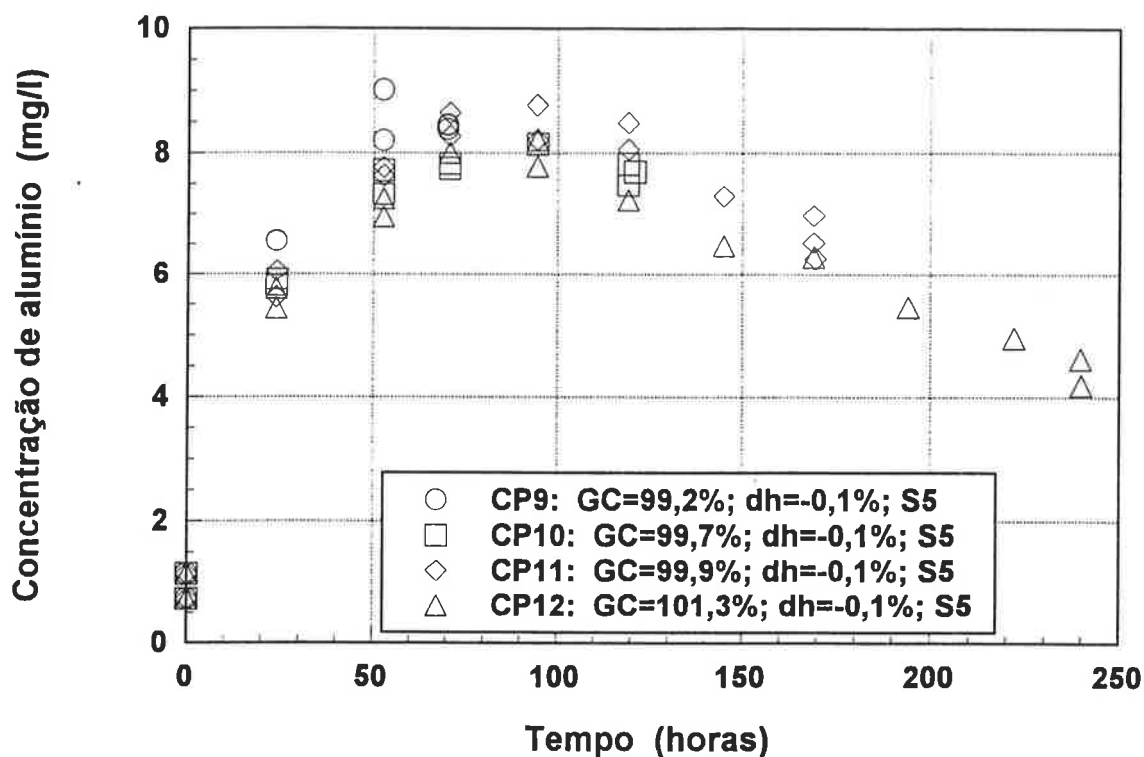
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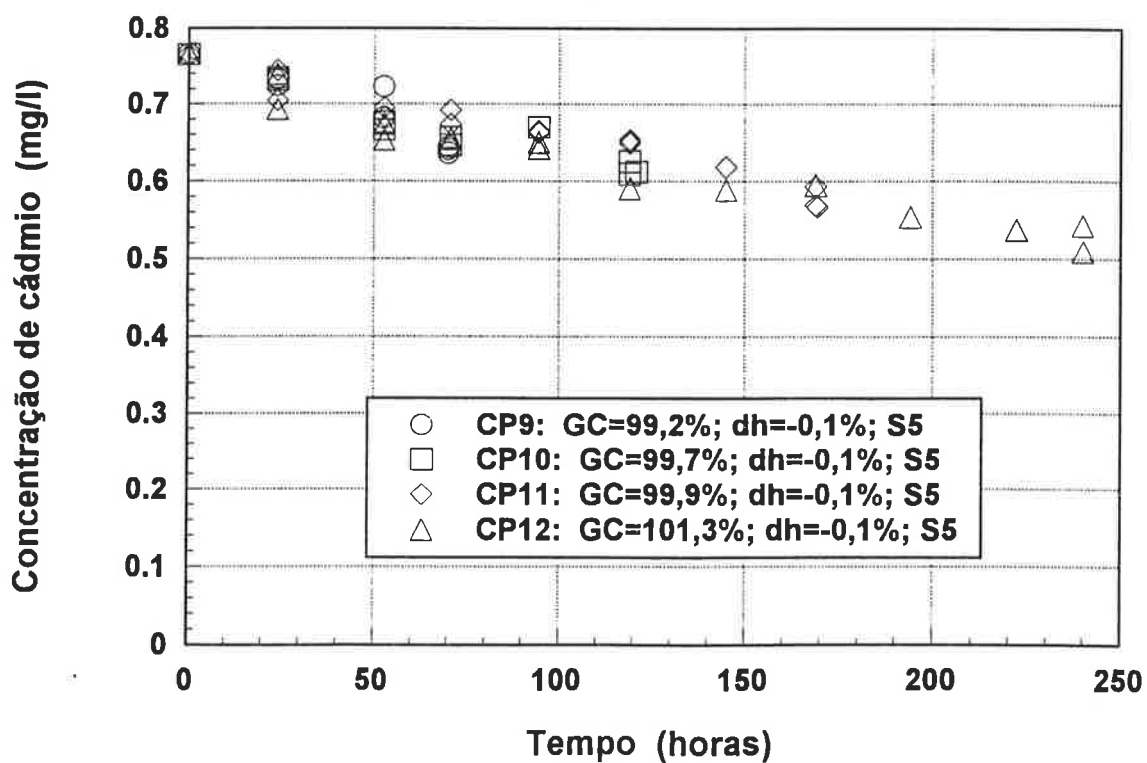
Concentração de zinco no reservatório CPs 5, 6, 7 e 8



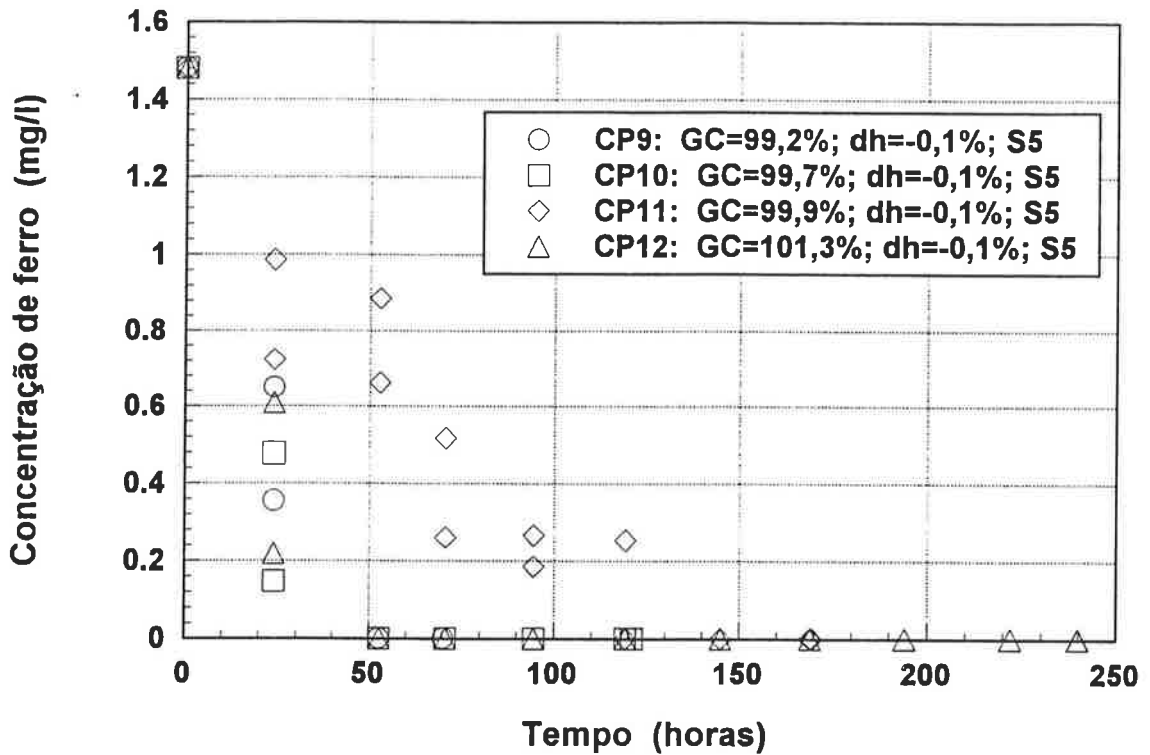
Concentração de alumínio no reservatório CPs 9, 10, 11 e 12



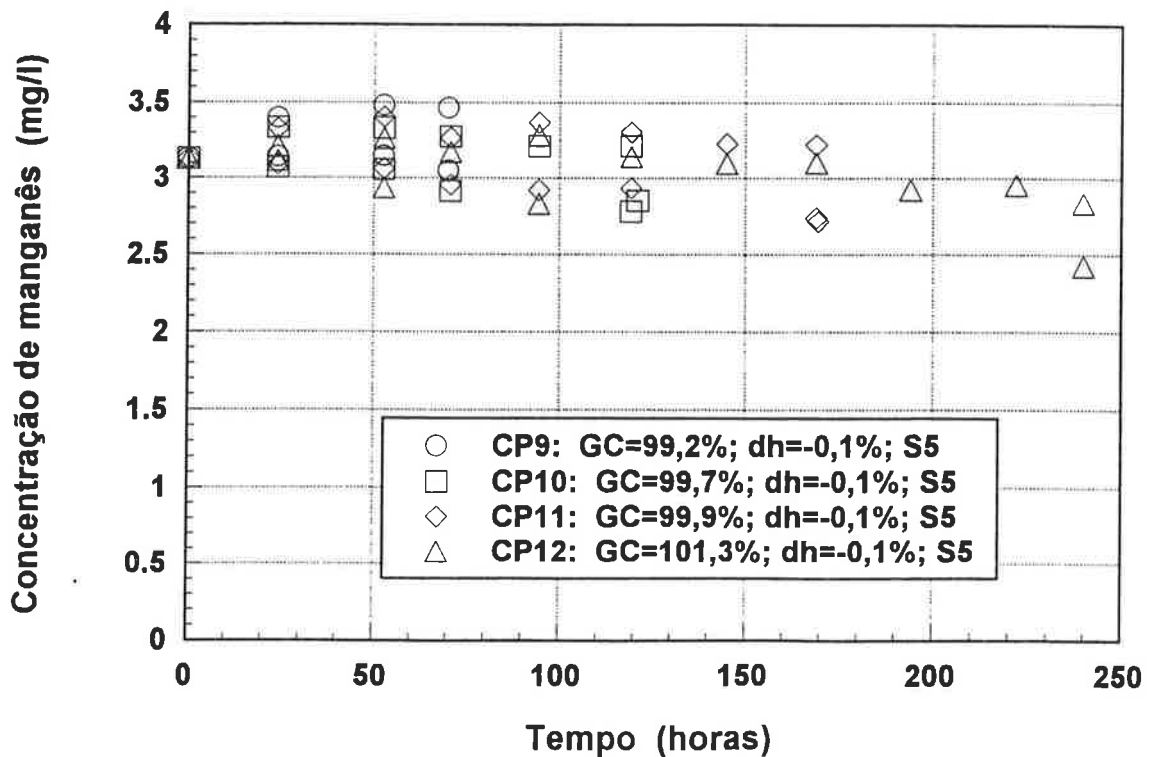
Concentração de cádmio no reservatório CPs 9, 10, 11 e 12



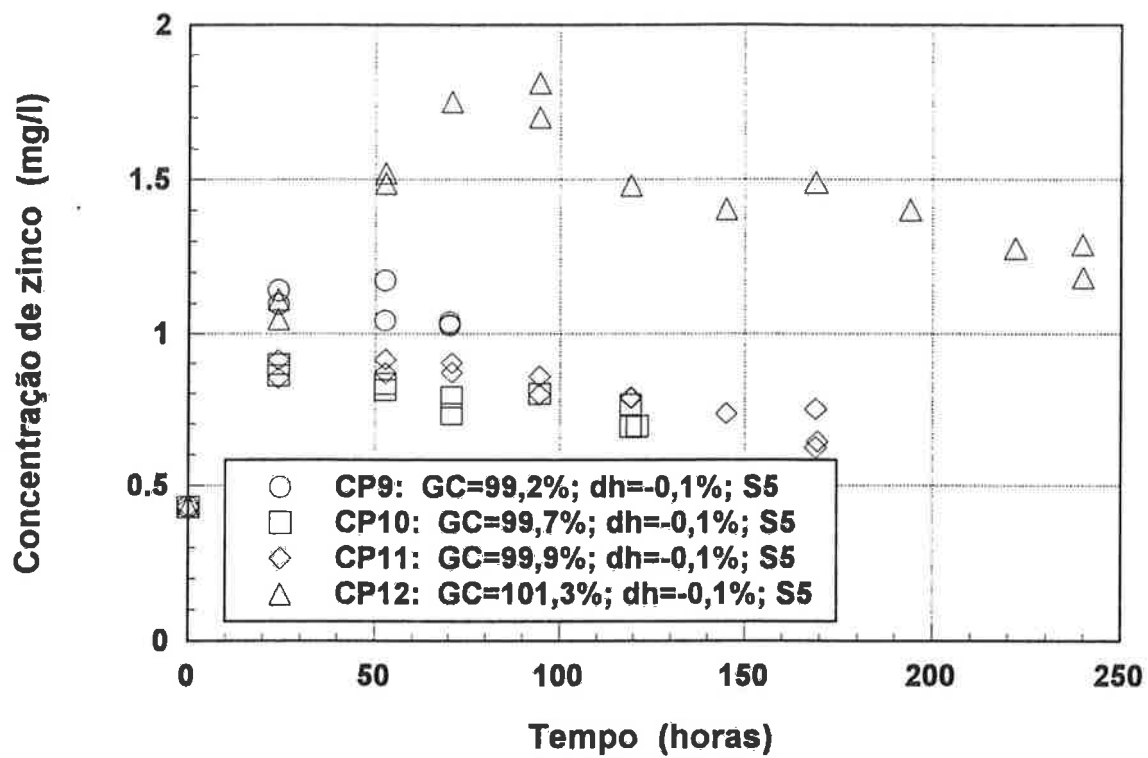
Concentração de ferro no reservatório CPs 9, 10, 11 e 12



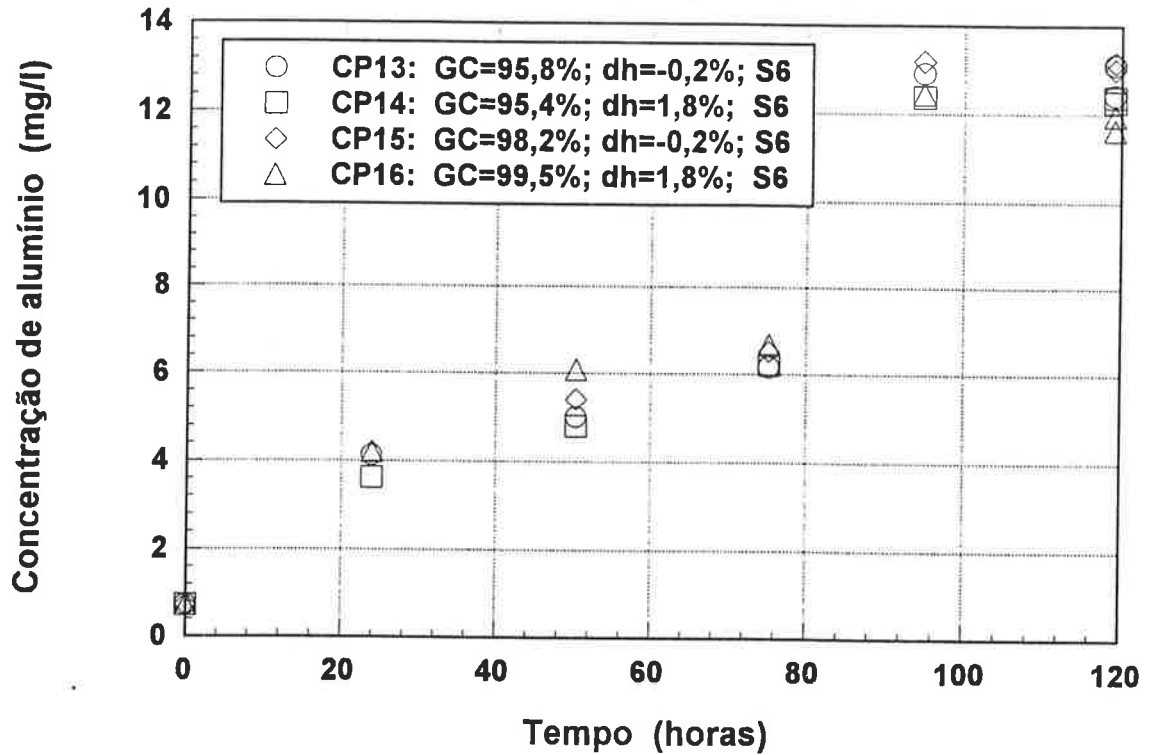
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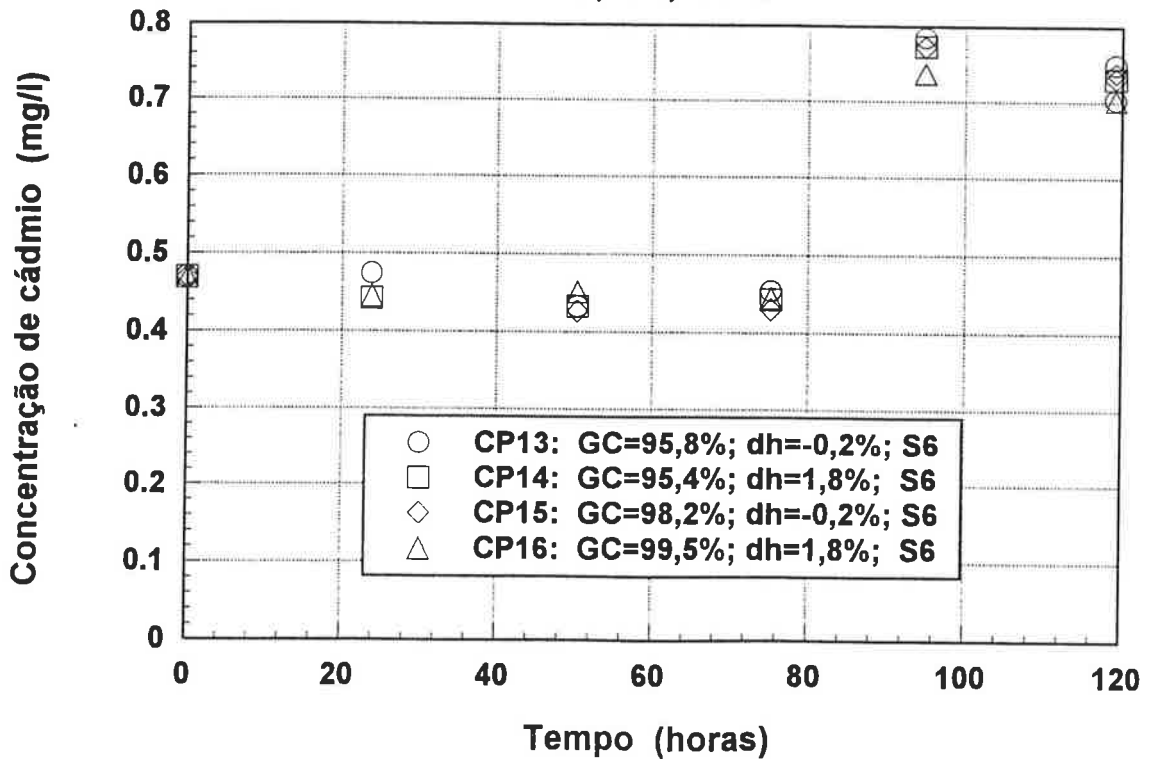
Concentração de zinco no reservatório CPs 9, 10, 11 e 12



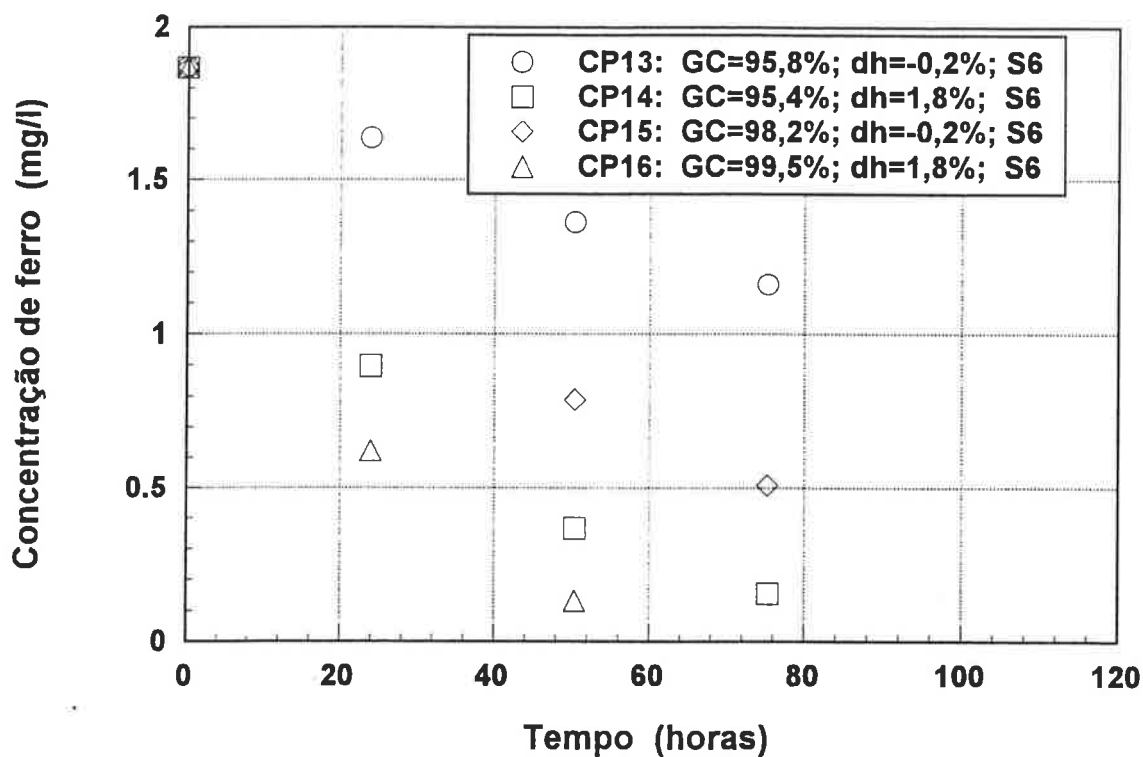
Concentração de alumínio no reservatório CPs 13, 14, 15 e 16



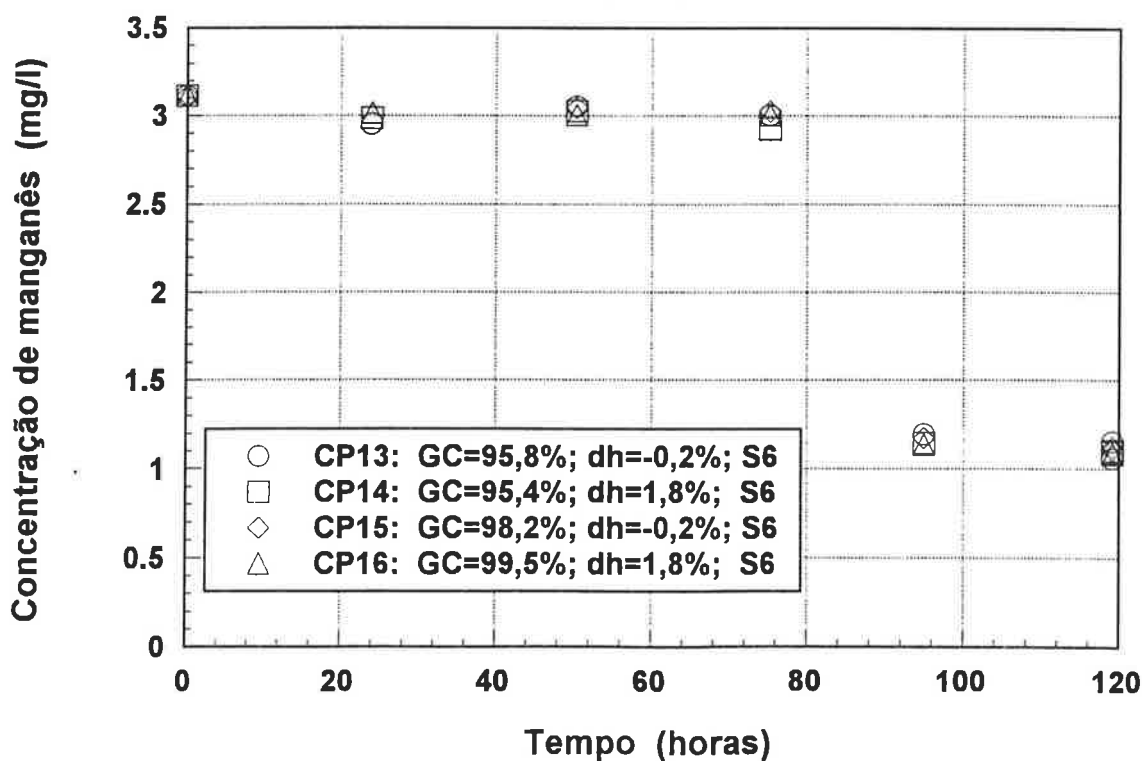
Concentração de cádmio no reservatório CPs 13, 14, 15 e 16



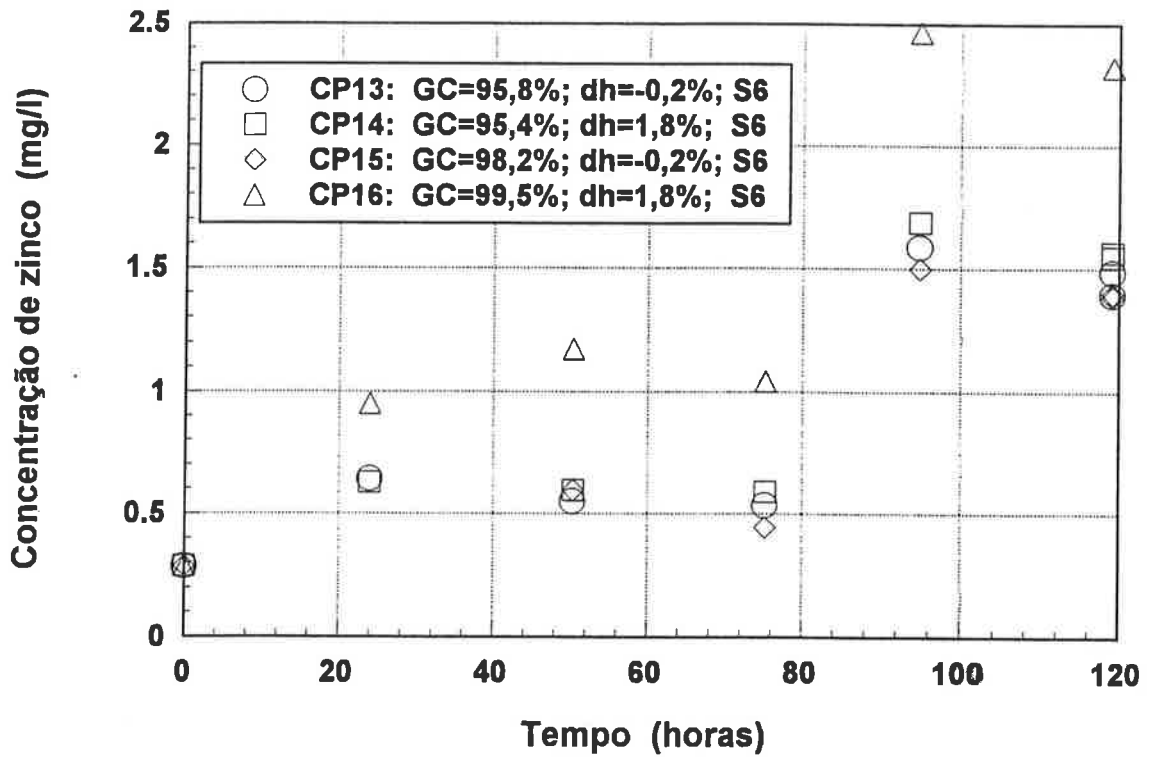
Concentração de ferro no reservatório CPs 13, 14, 15 e 16



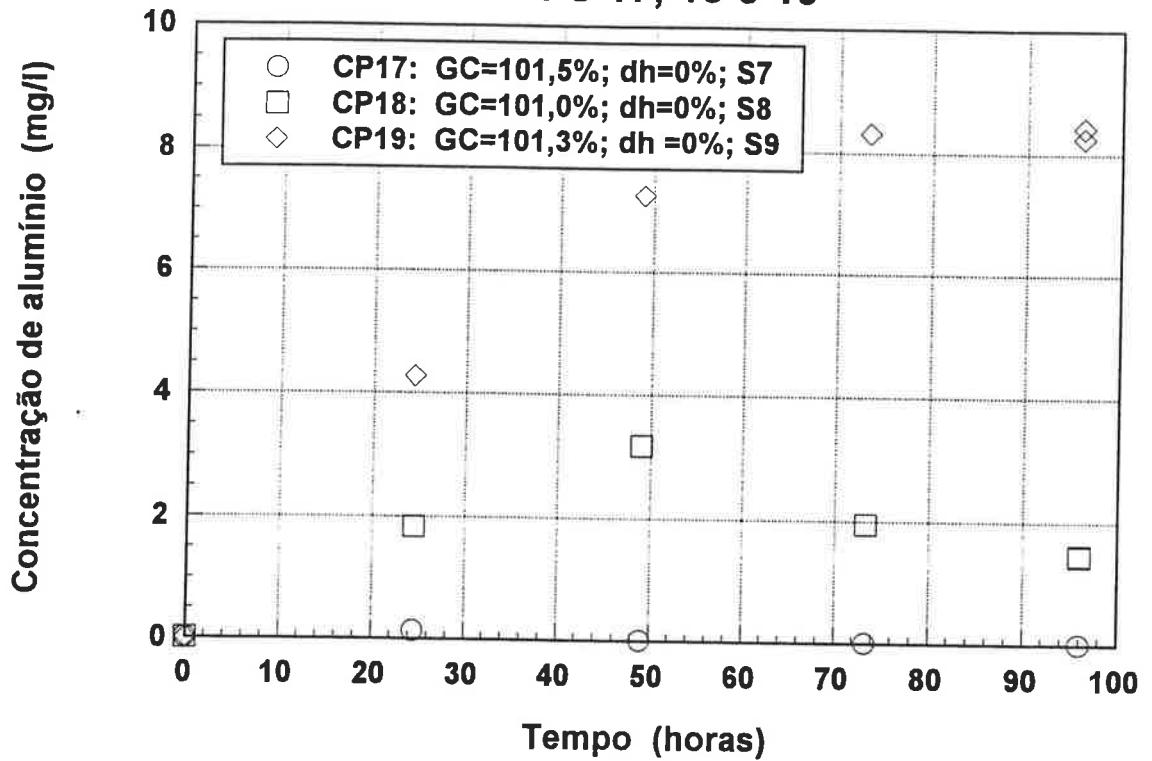
Concentração de manganês no reservatório CPs 13, 14, 15 e 16



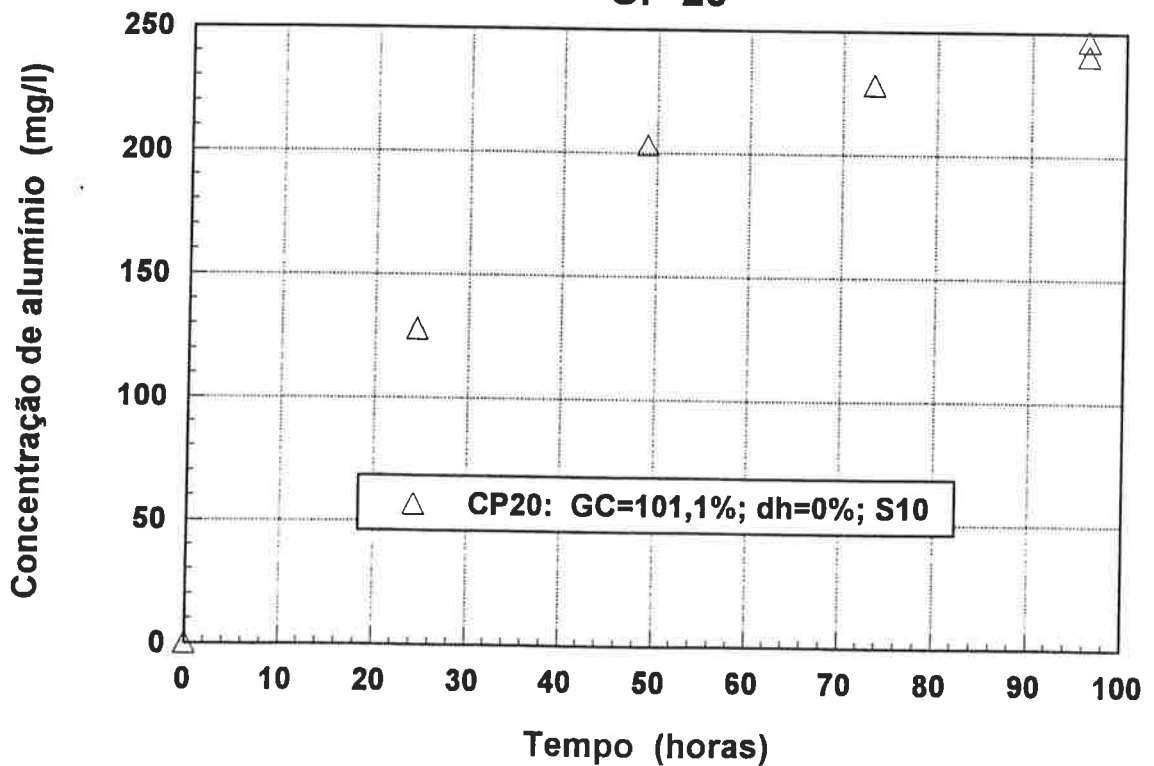
Concentração de zinco no reservatório CPs 13, 14, 15 e 16



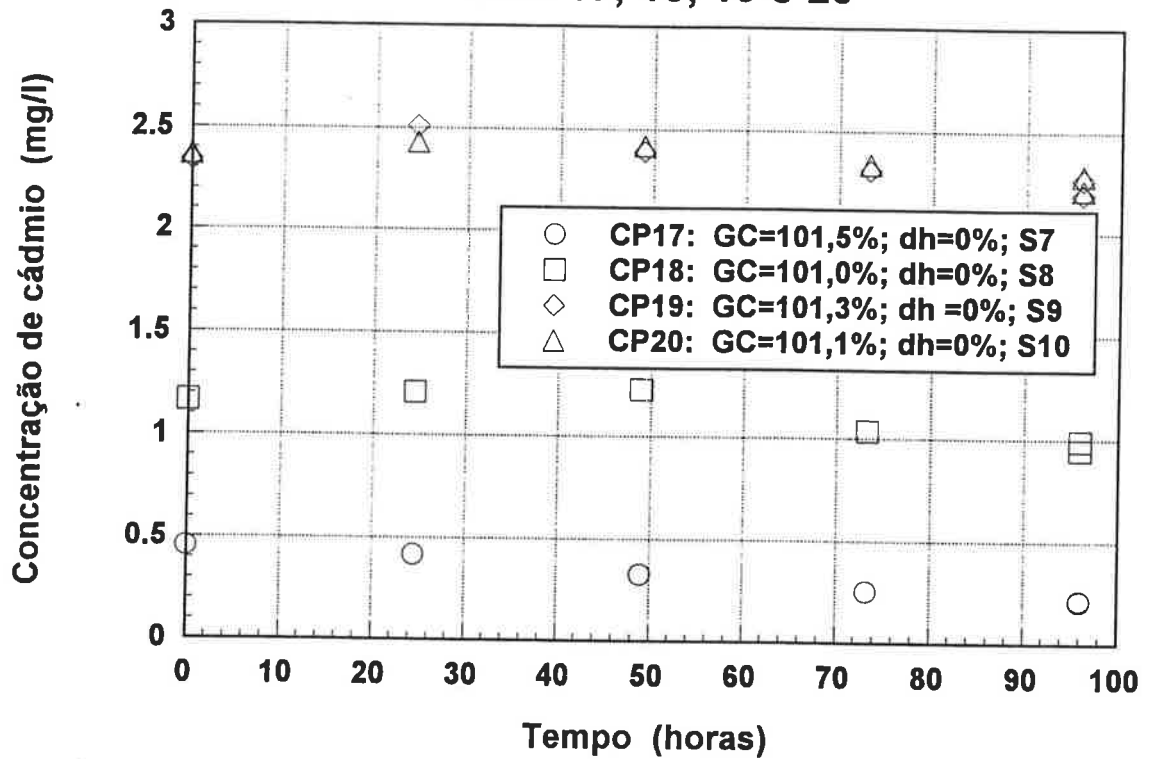
Concentração de alumínio no reservatório CPs 17, 18 e 19



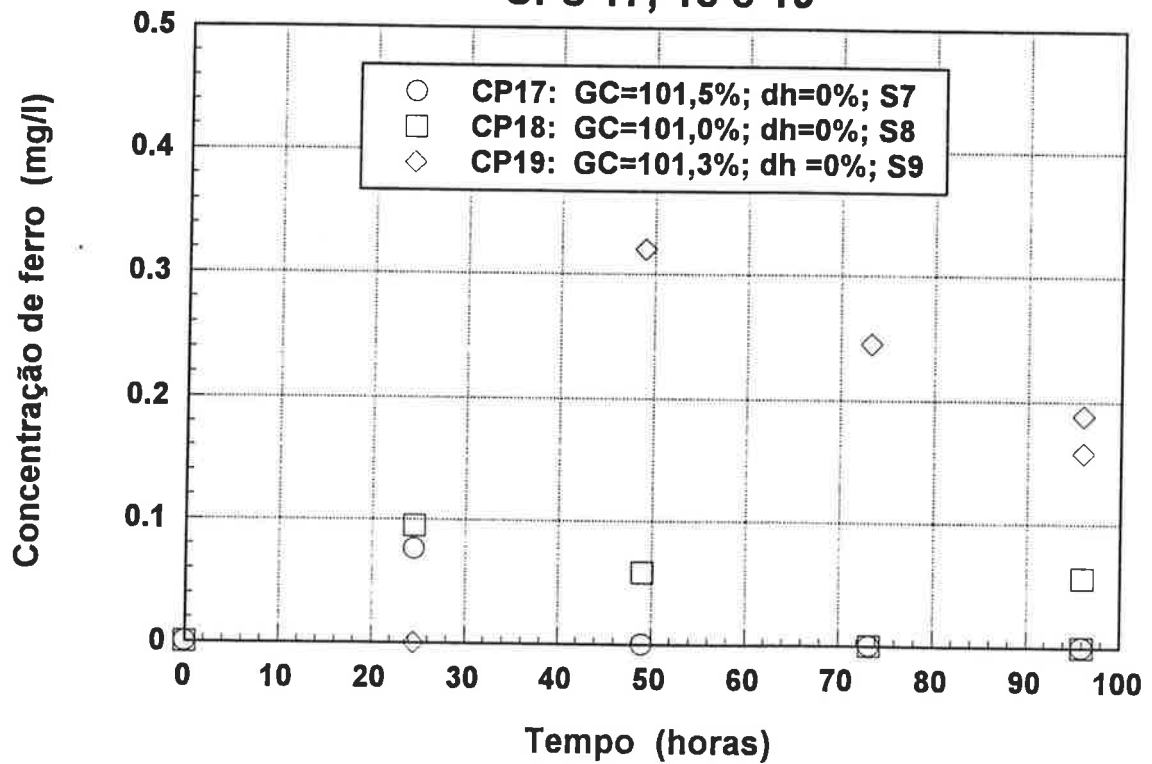
Concentração de alumínio no reservatório CP 20



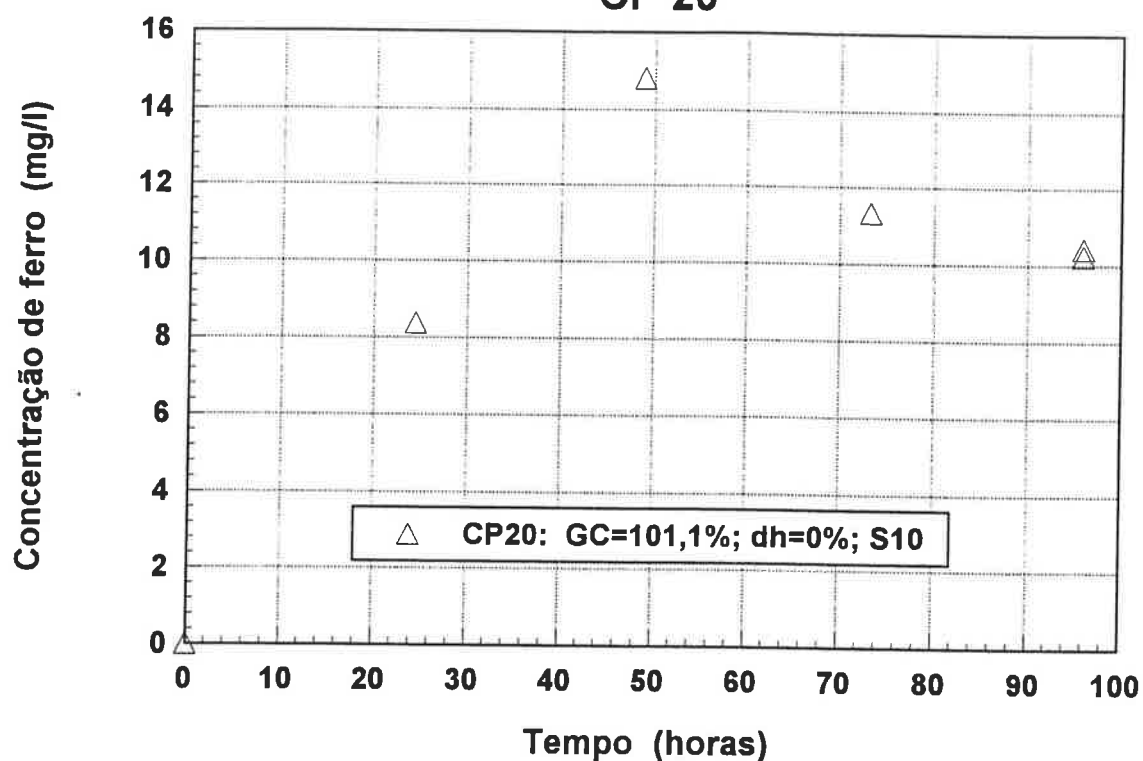
Concentração de cádmio no reservatório CPs 17, 18, 19 e 20



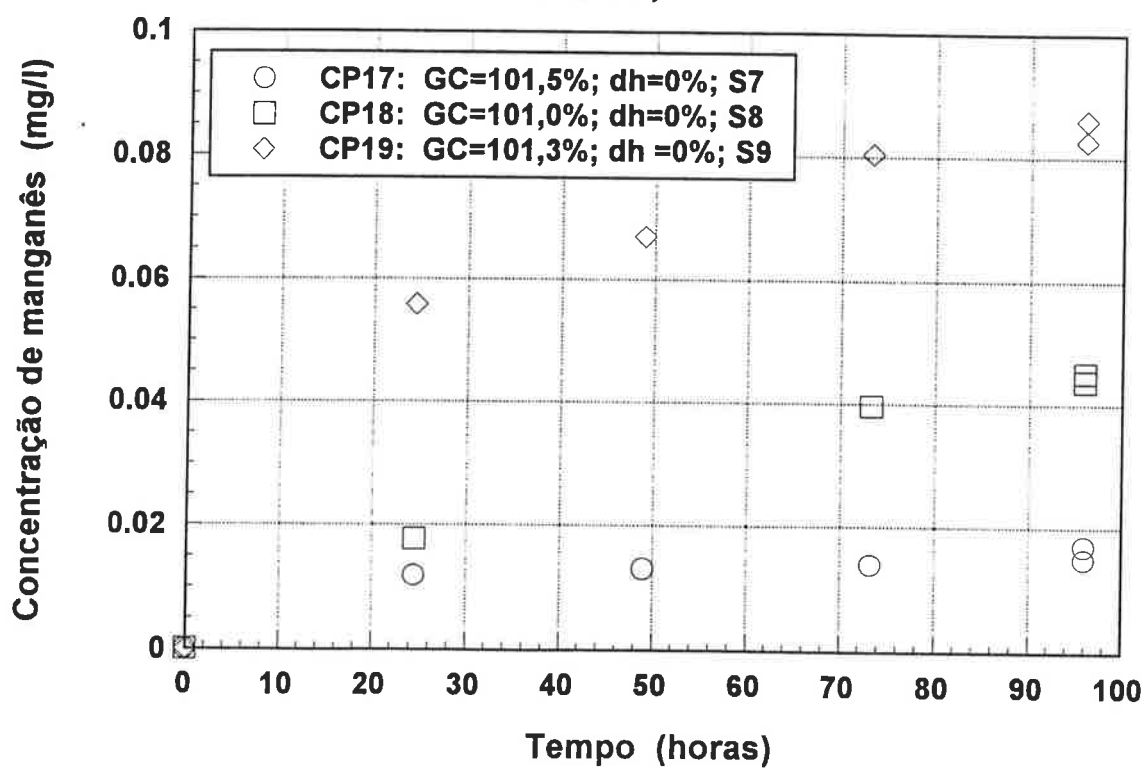
Concentração de ferro no reservatório CPs 17, 18 e 19



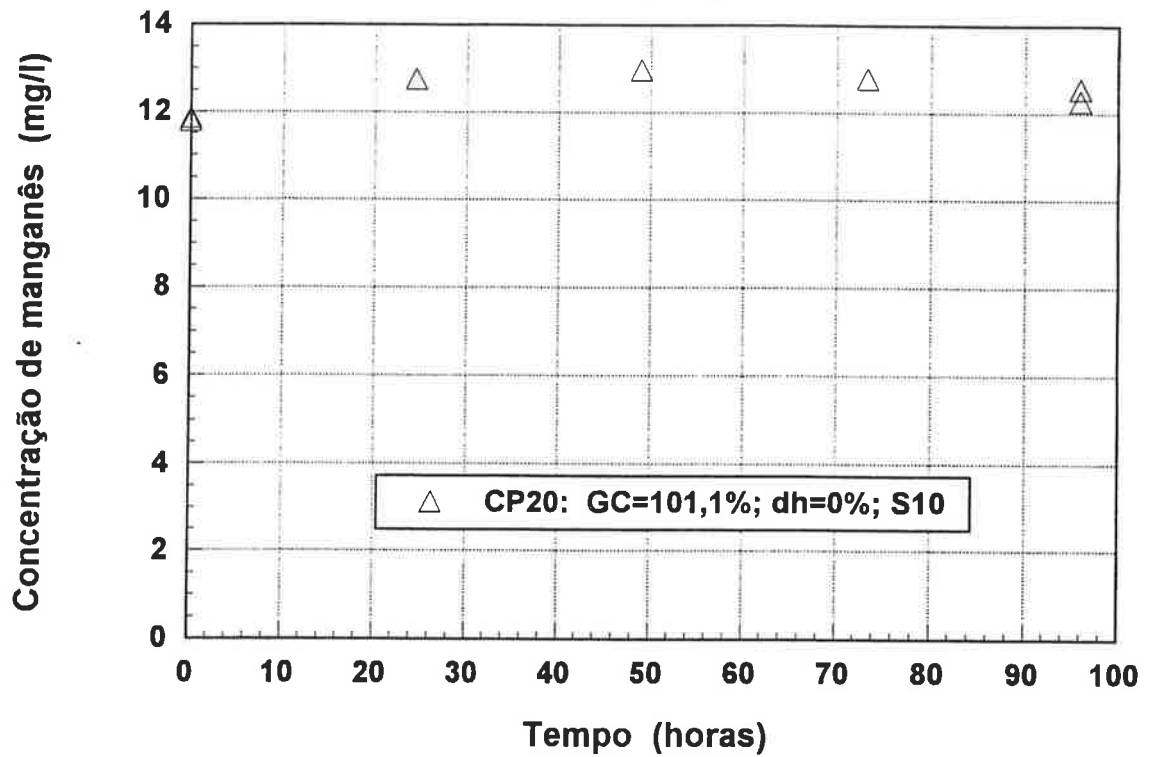
Concentração de ferro no reservatório CP 20



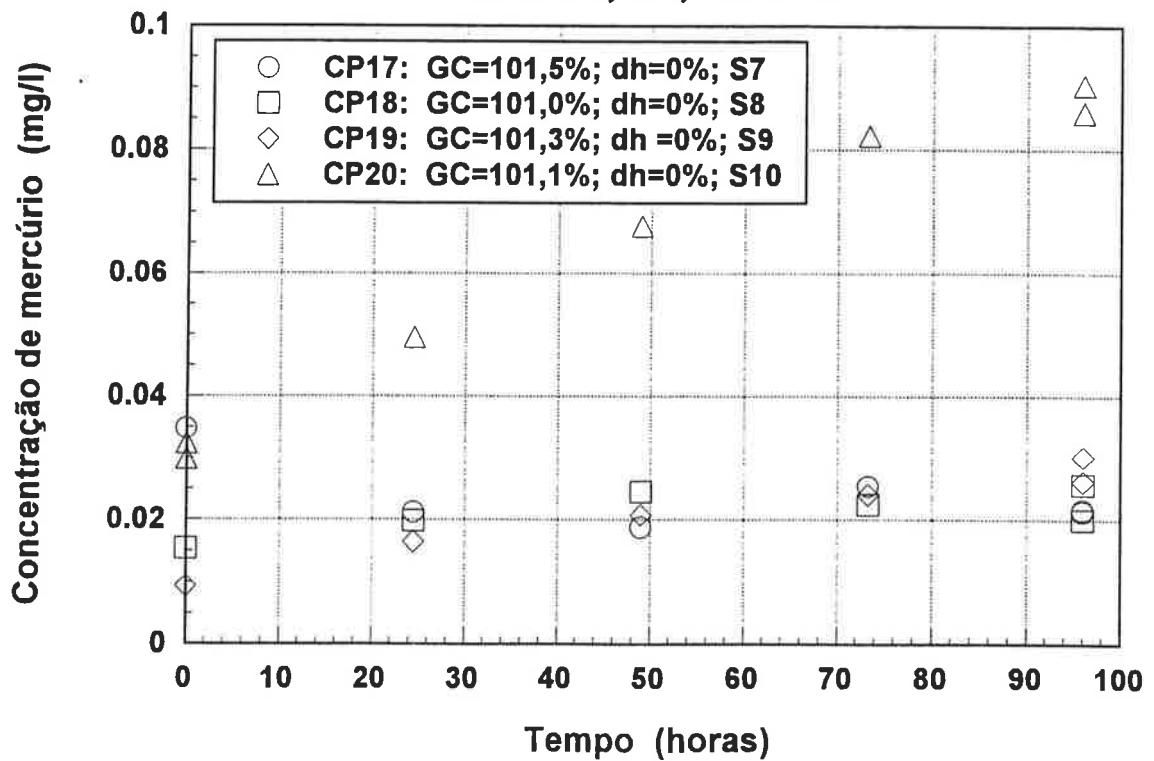
Concentração de manganês no reservatório CPs 17, 18 e 19



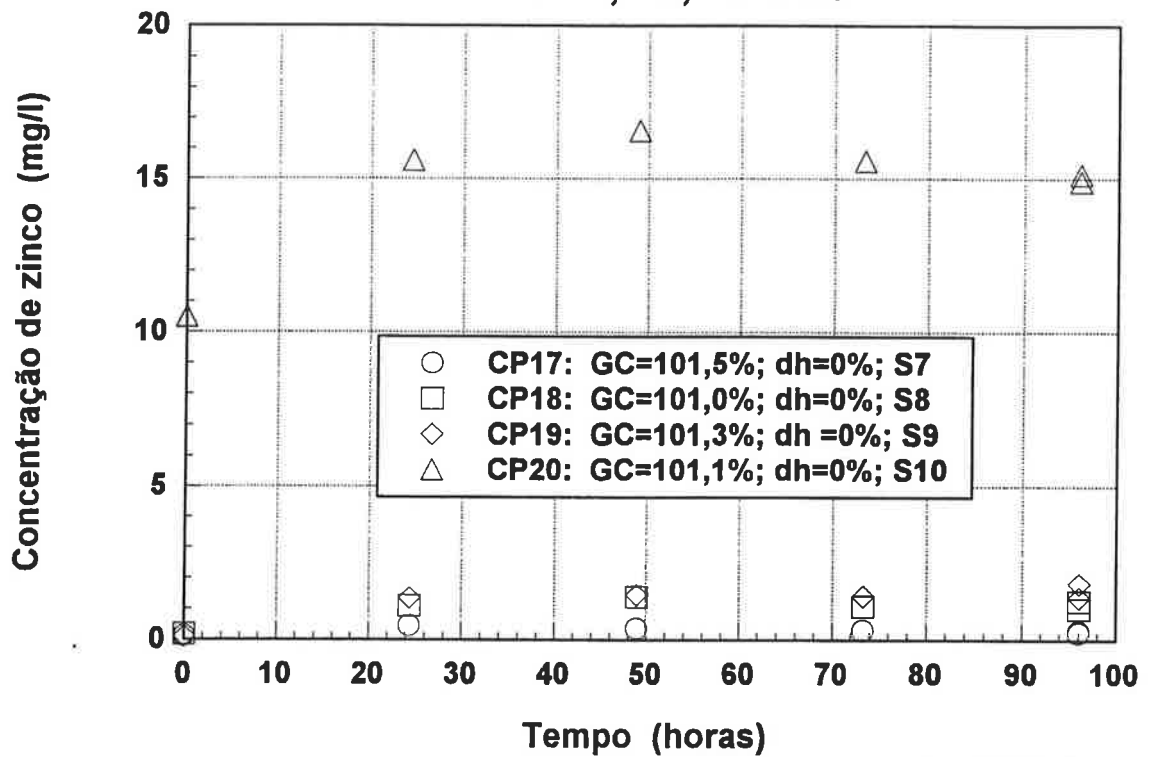
Concentração de manganês no reservatório CP 20



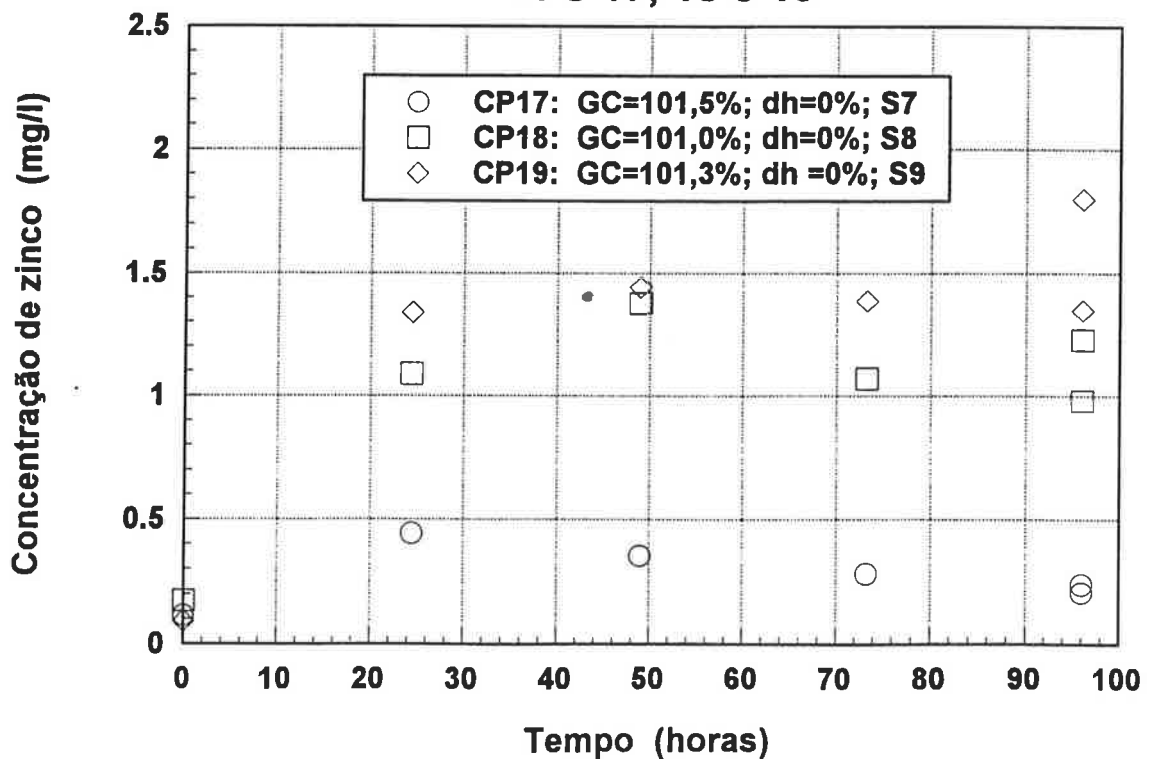
Concentração de mercúrio no reservatório CPs 17, 18, 19 e 20



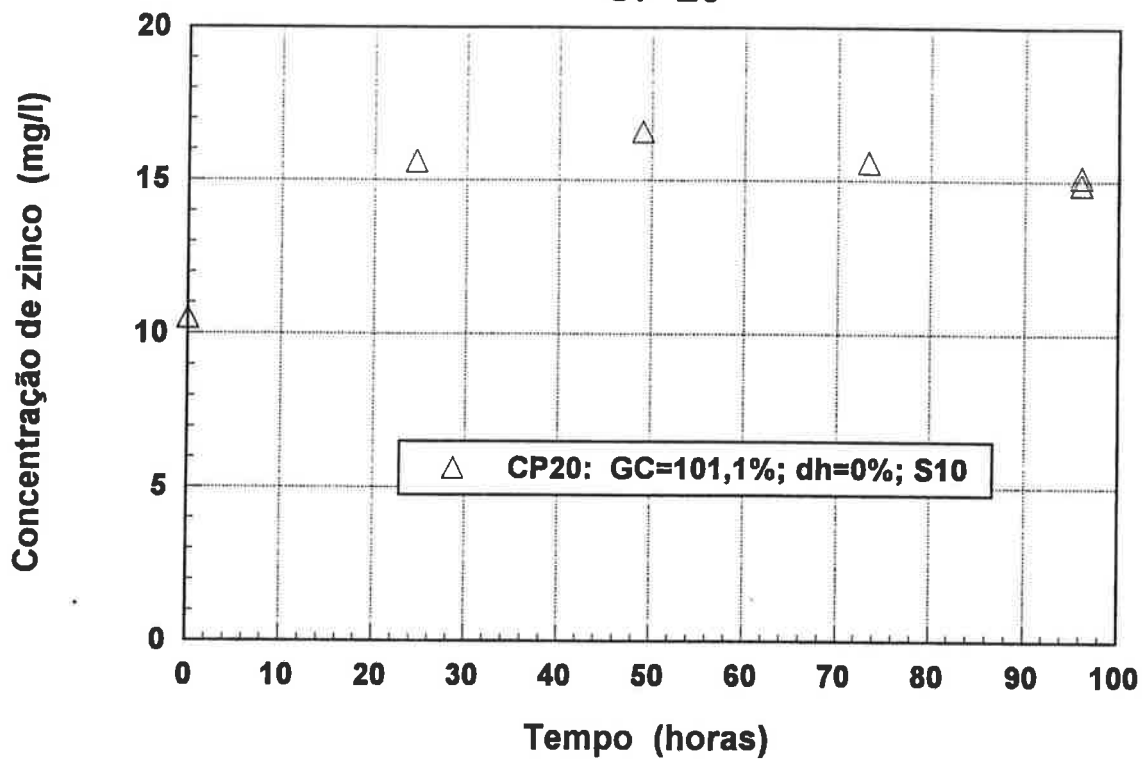
Concentração de zinco no reservatório CPs 17, 18, 19 e 20



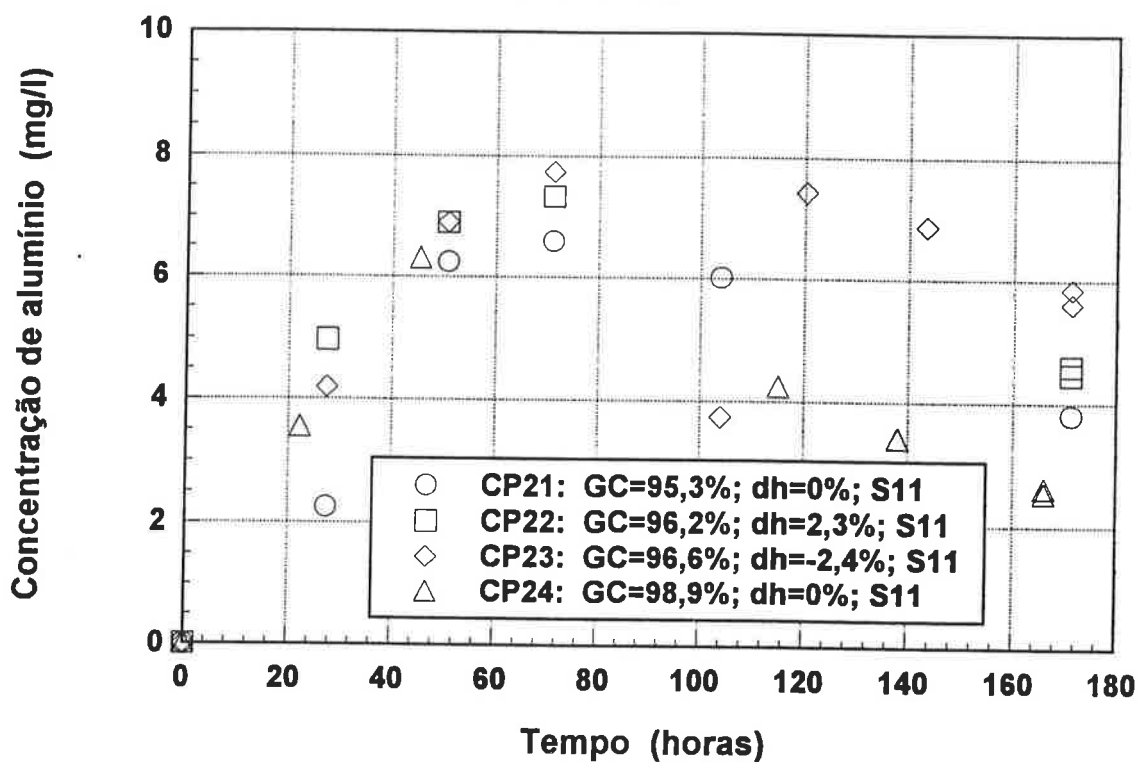
Concentração de zinco no reservatório CPs 17, 18 e 19



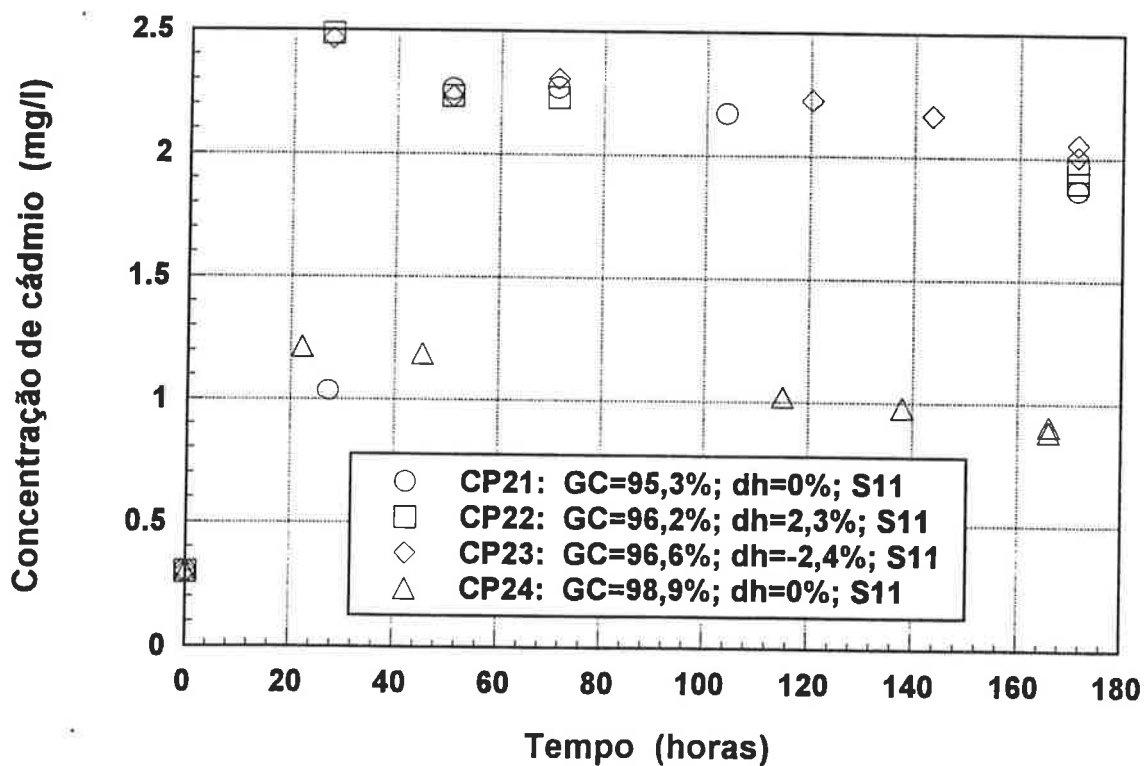
Concentração de zinco no reservatório CP 20



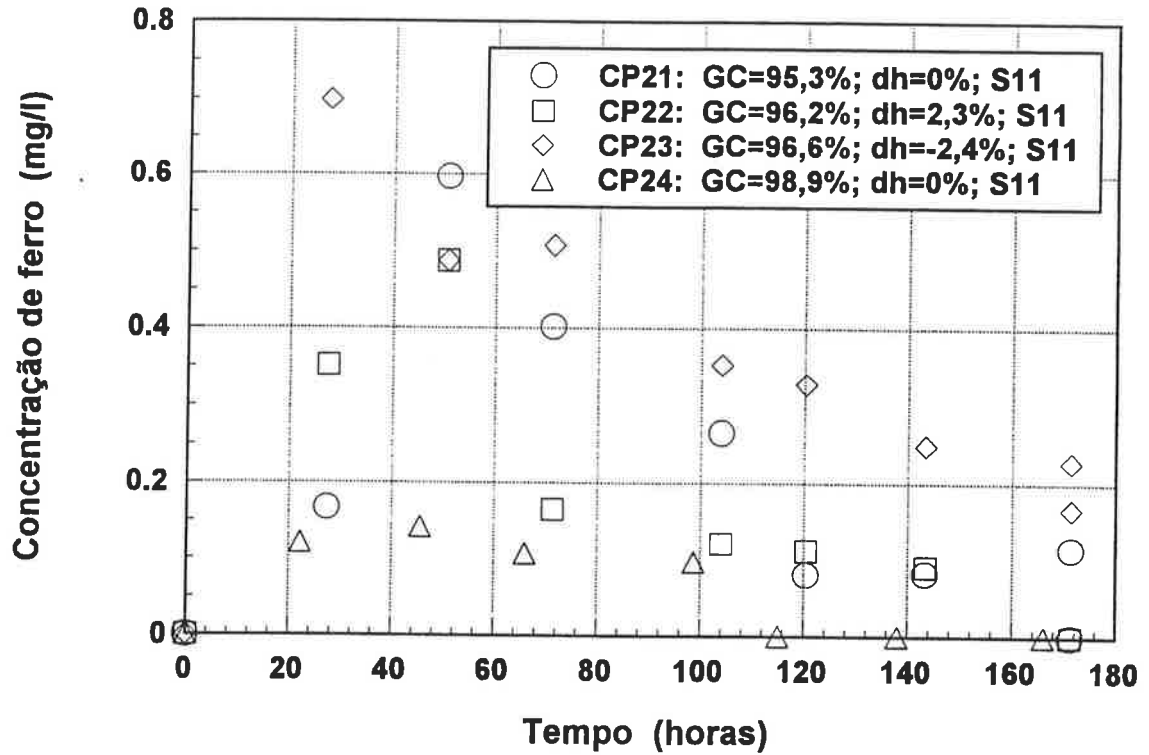
Concentração de alumínio no reservatório CPs 21, 22, 23 e 24



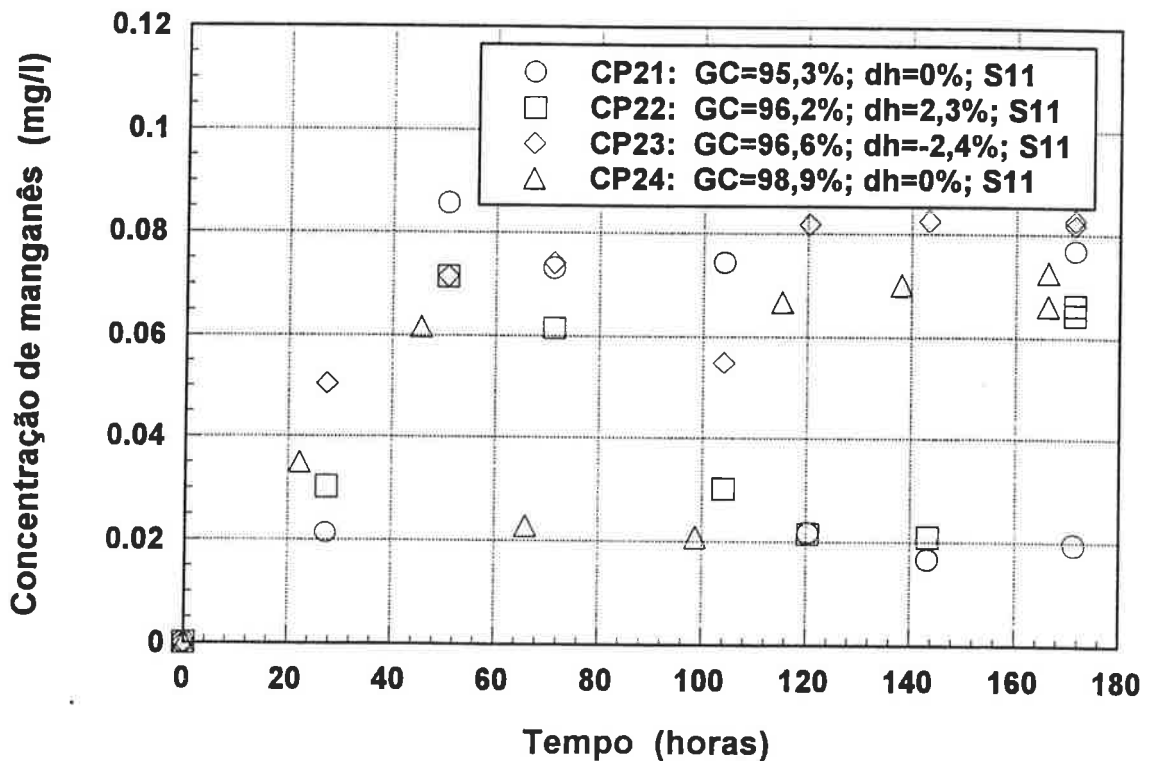
Concentração de cádmio no reservatório CPs 21, 22, 23 e 24



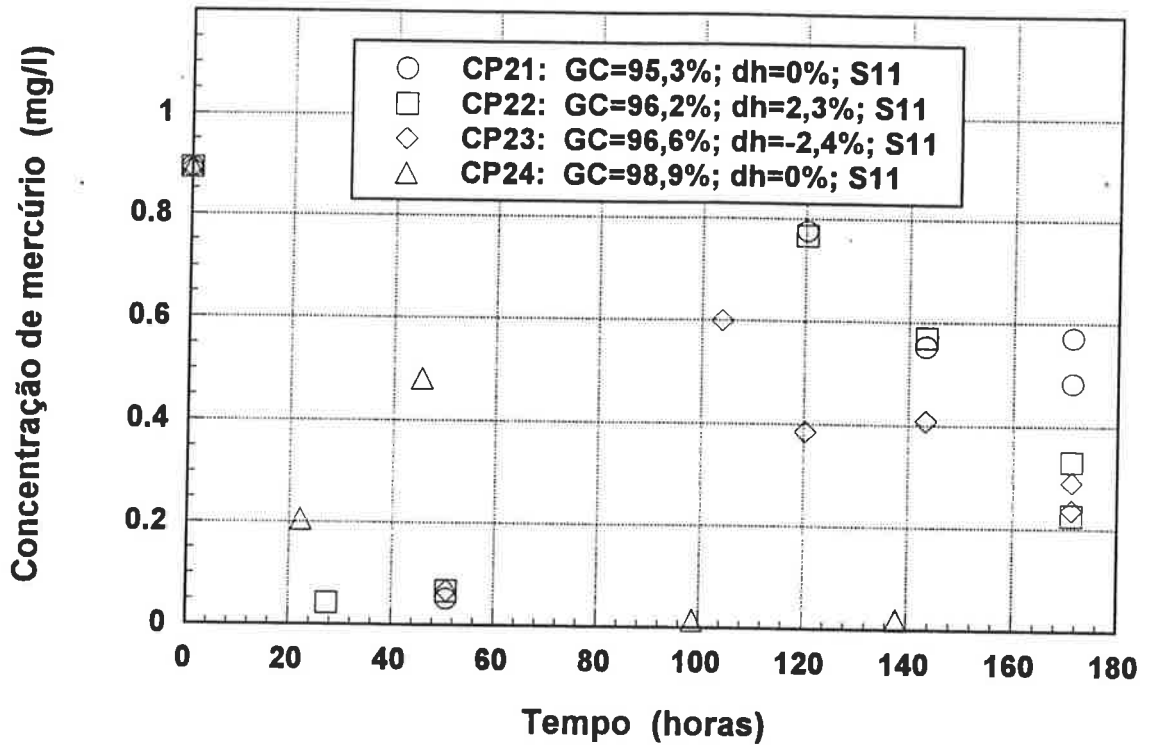
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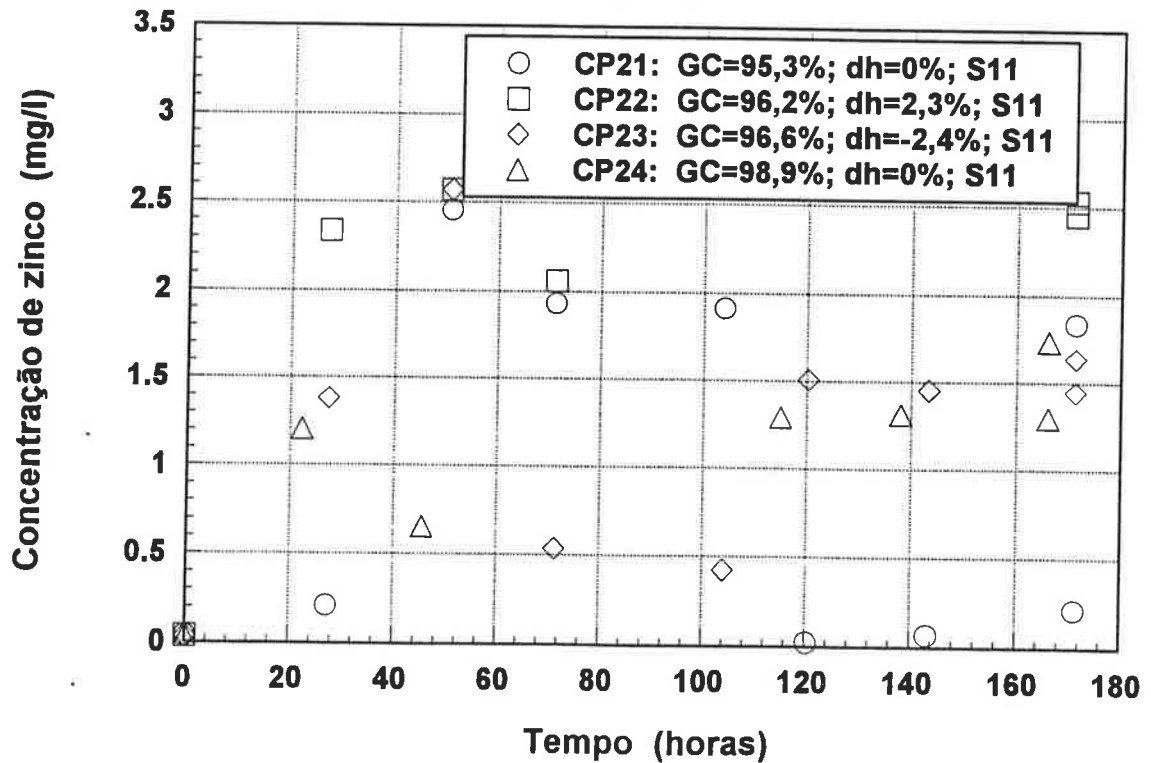
Concentração de manganês no reservatório CPs 21, 22, 23 e 24



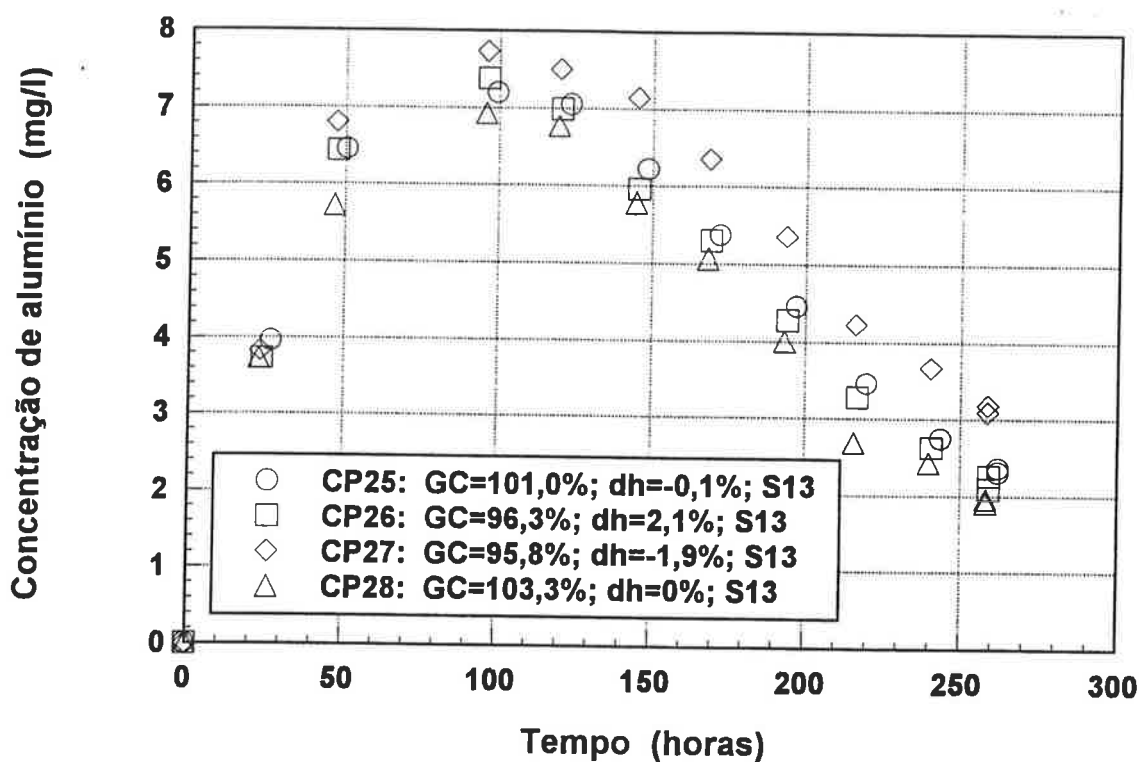
Concentração de mercúrio no reservatório CPs 21, 22, 23 e 24



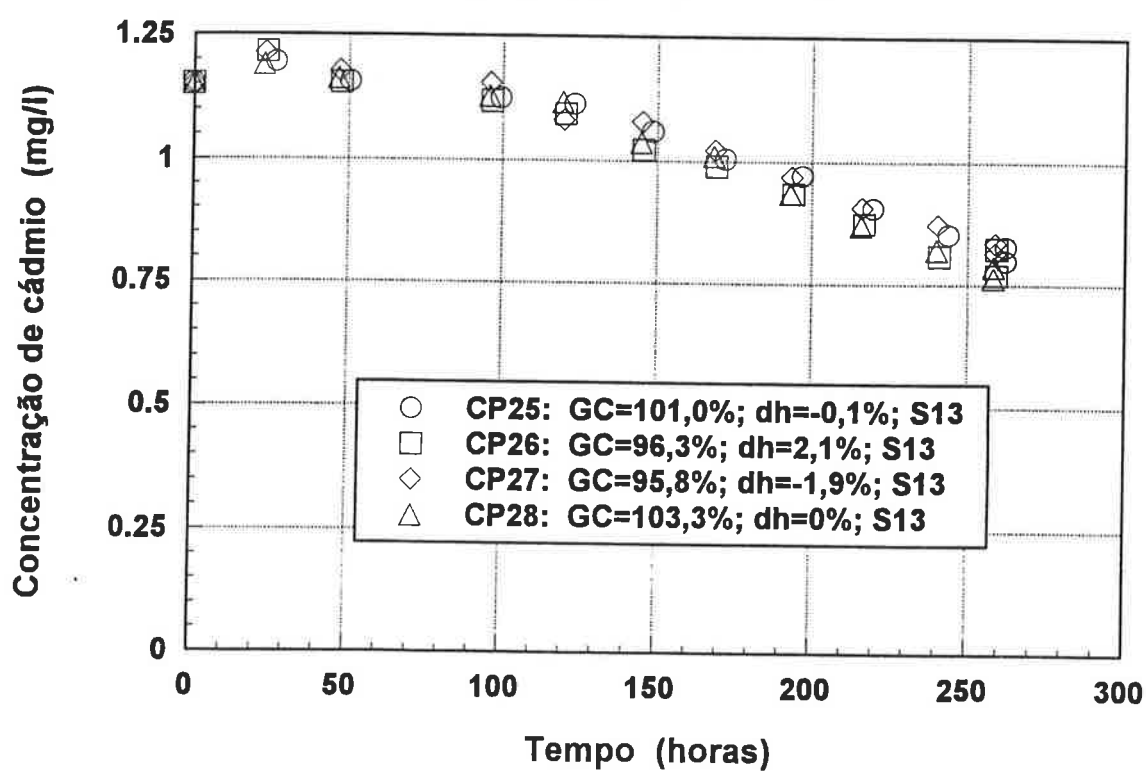
Concentração de zinco no reservatório CPs 21, 22, 23 e 24



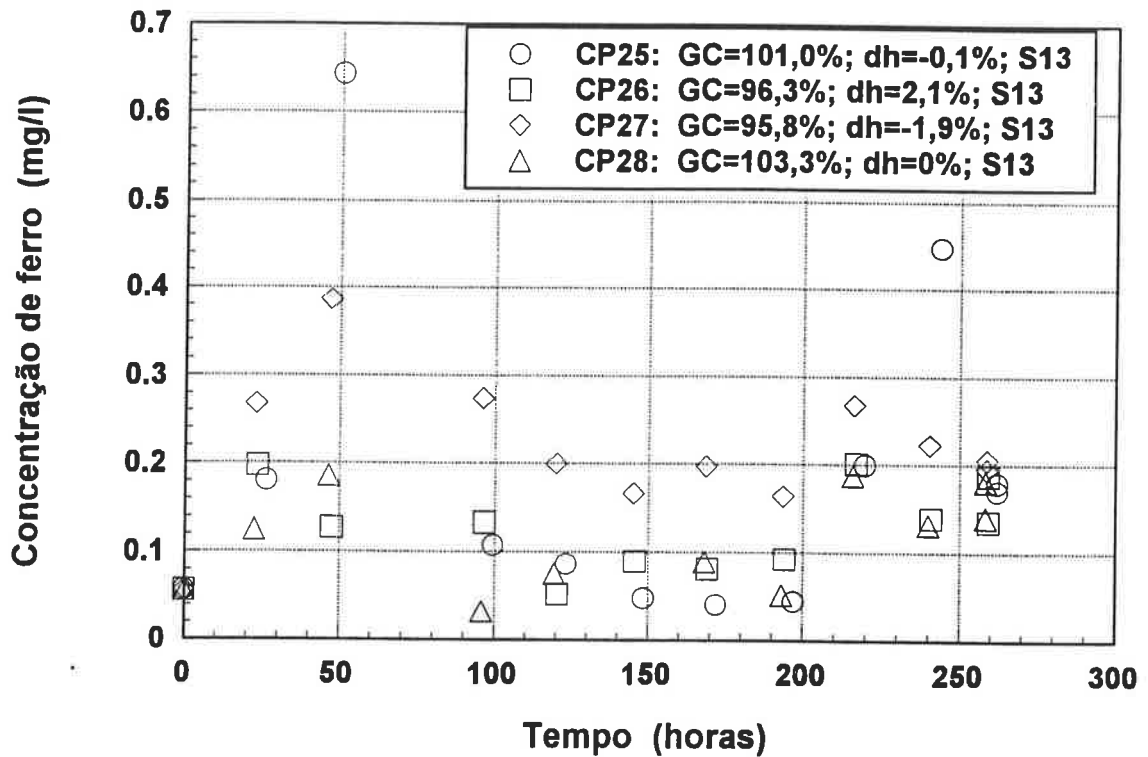
Concentração de alumínio no reservatório CPs 25, 26, 27 e 28



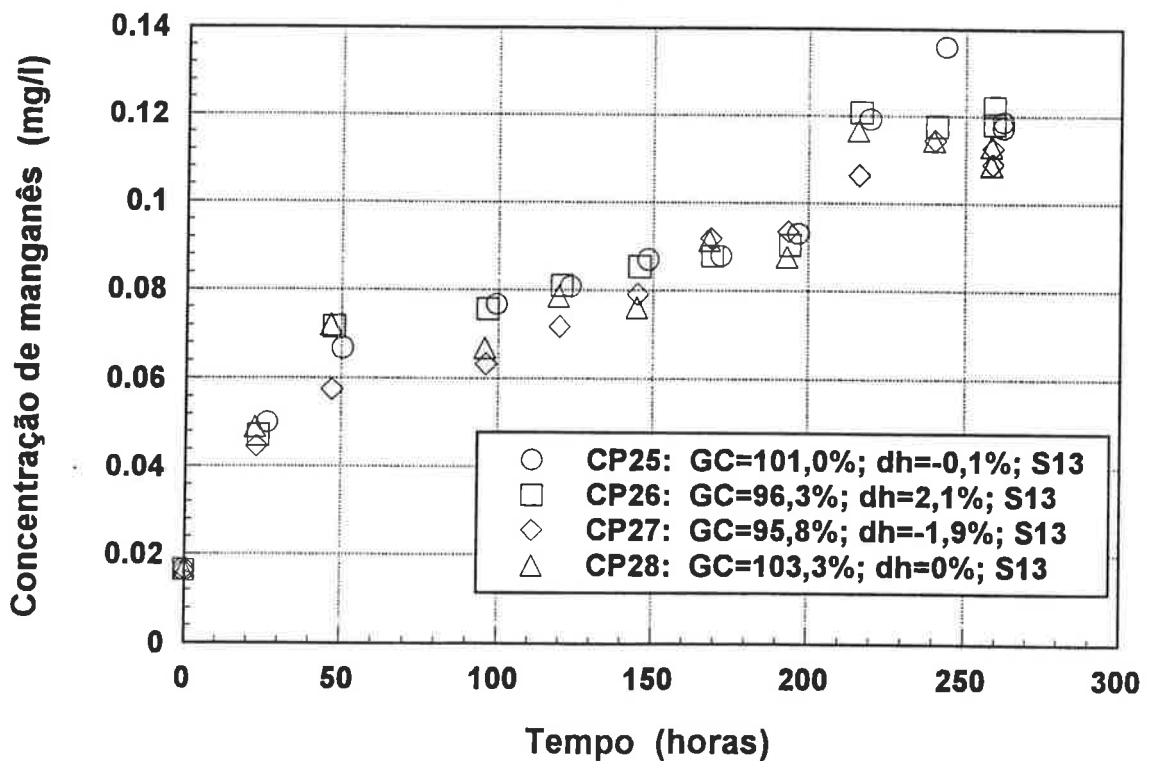
Concentração de cádmio no reservatório CPs 25, 26, 27 e 28



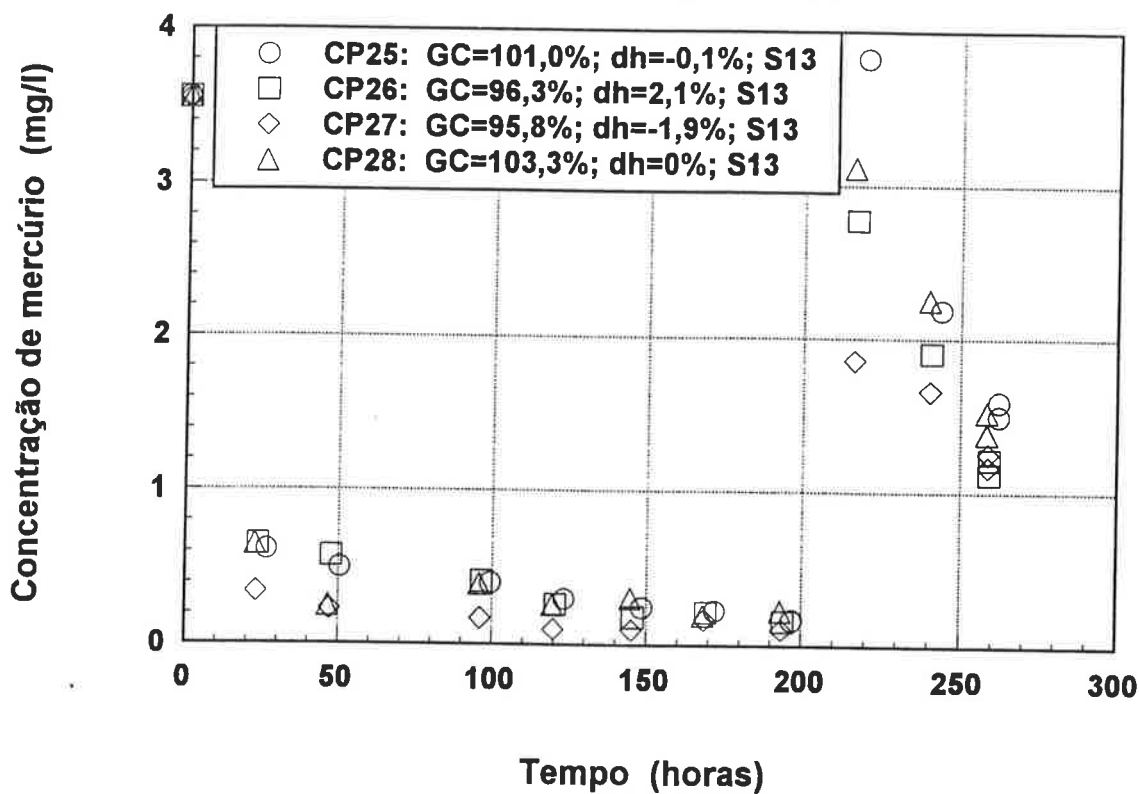
Concentração de ferro no reservatório CPs 25, 26, 27 e 28



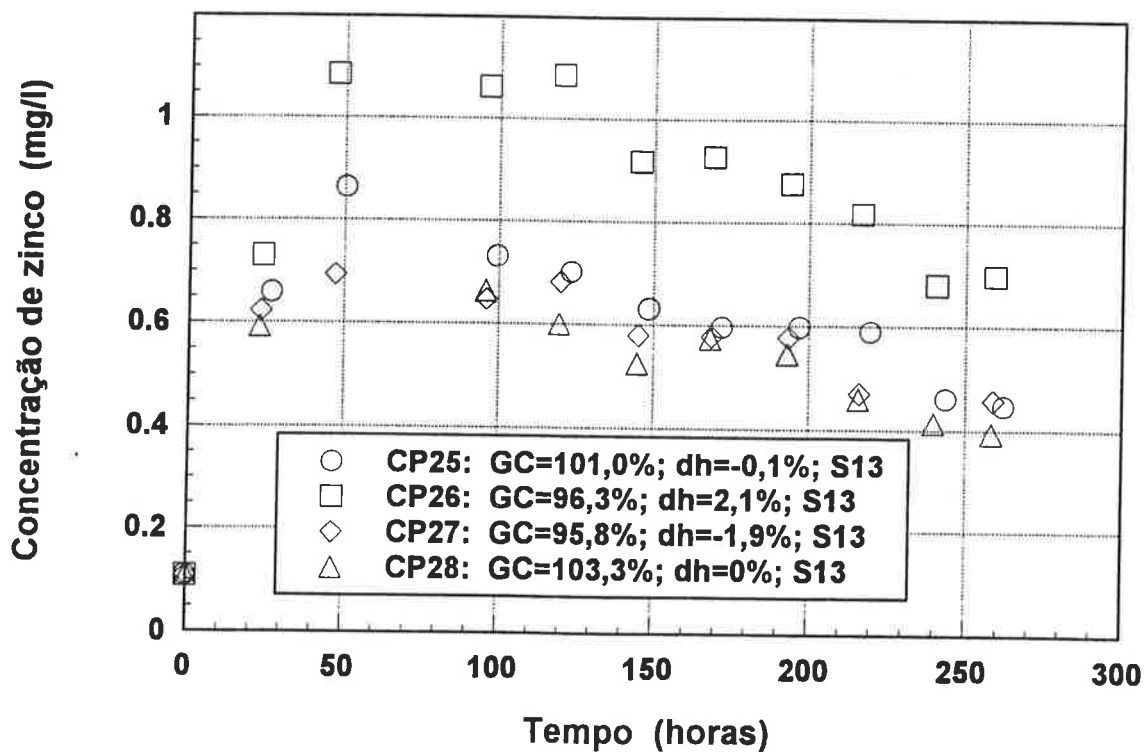
Concentração de manganês no reservatório CPs 25, 26, 27 e 28



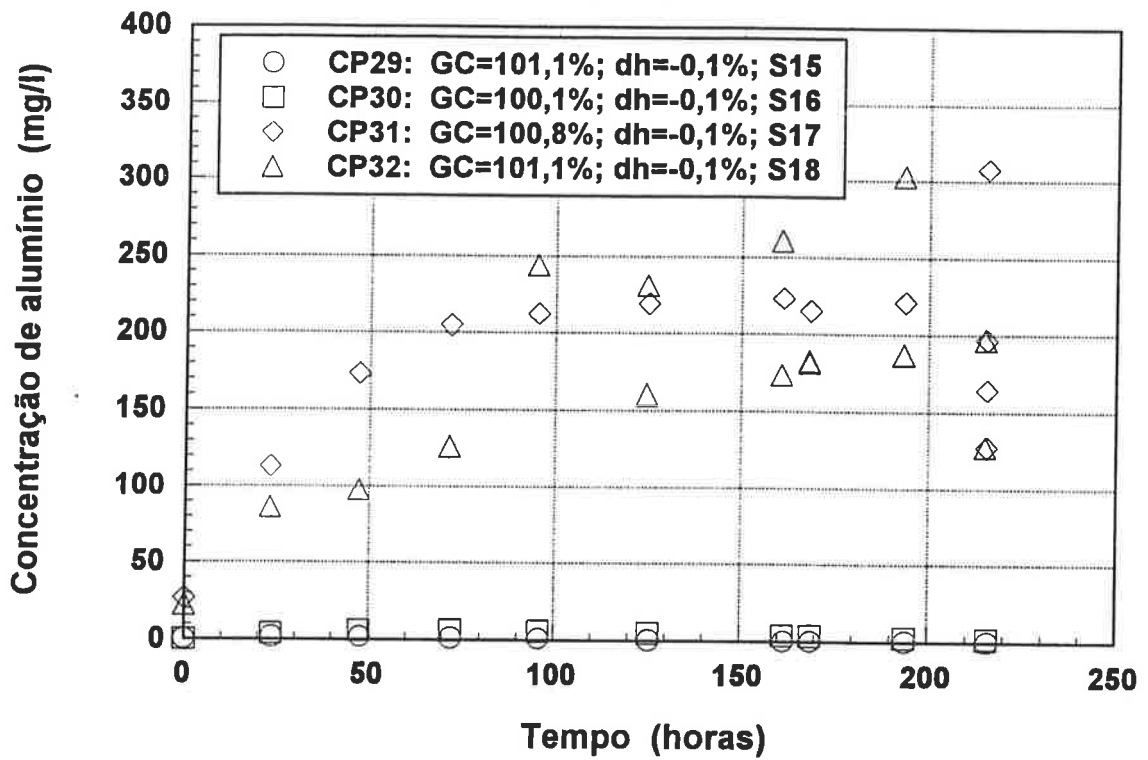
Concentração de mercúrio no reservatório CPs 25, 26, 27 e 28



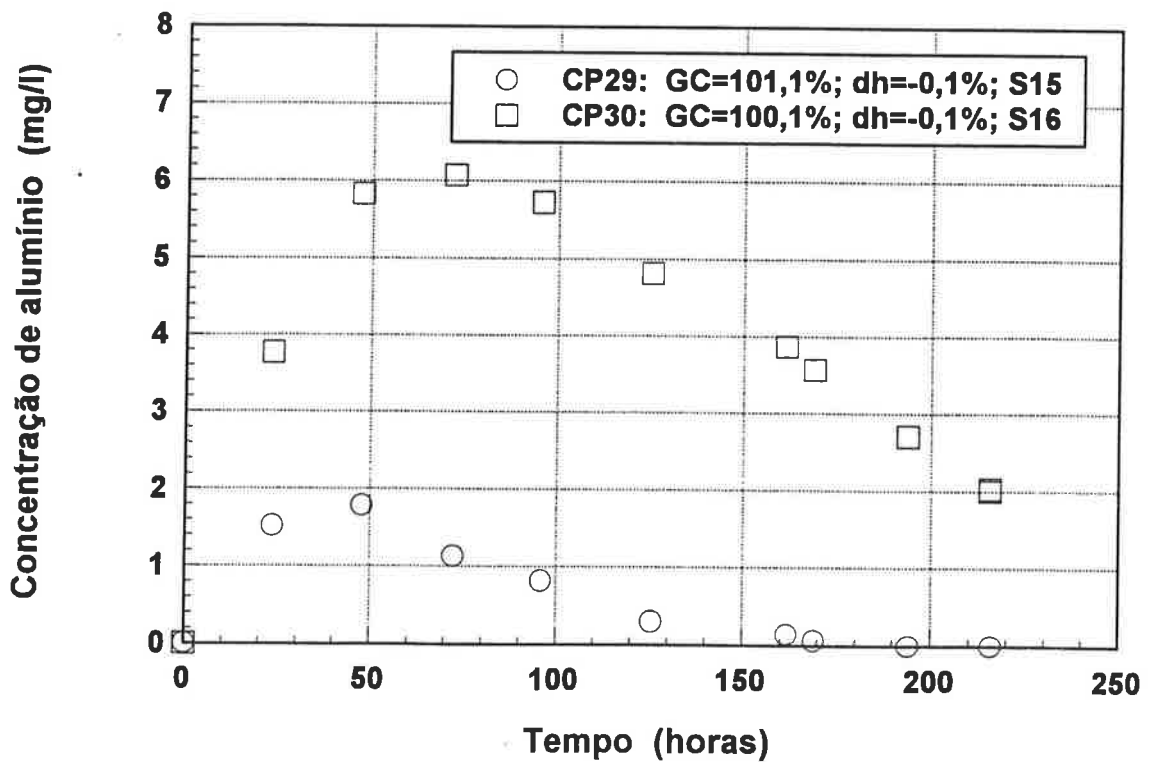
Concentração de zinco no reservatório CPs 25, 26, 27 e 28



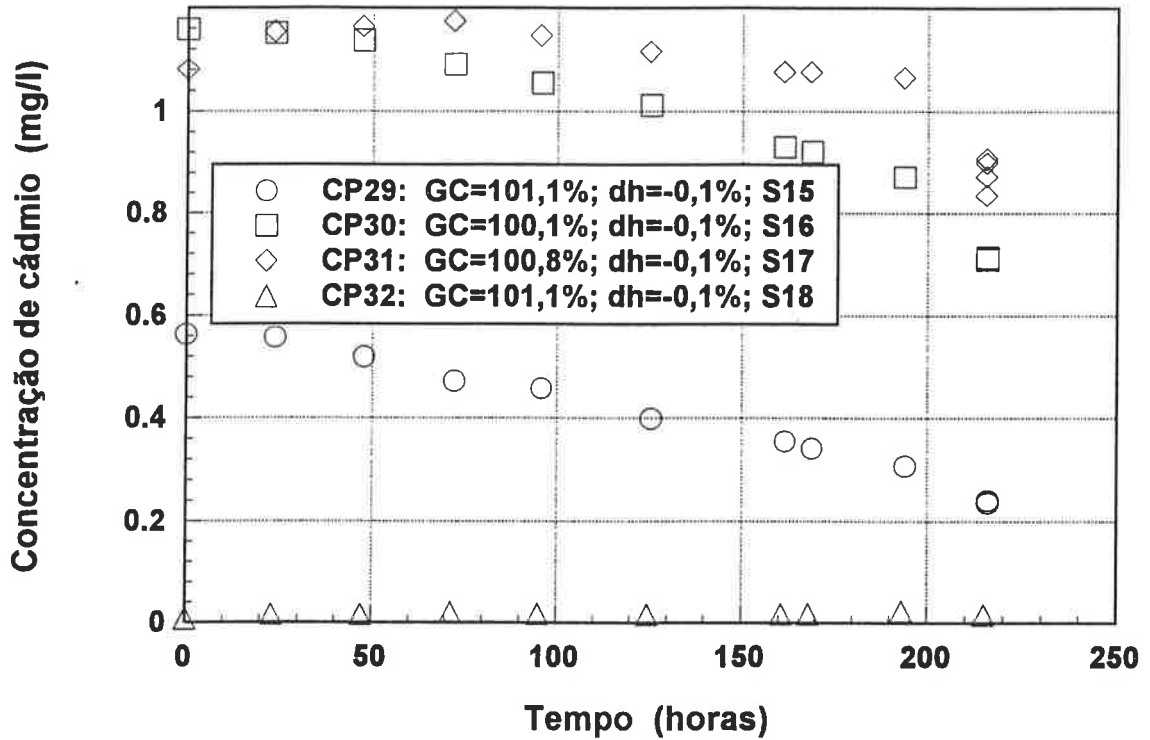
Concentração de alumínio no reservatório CPs 29, 30, 31 e 32



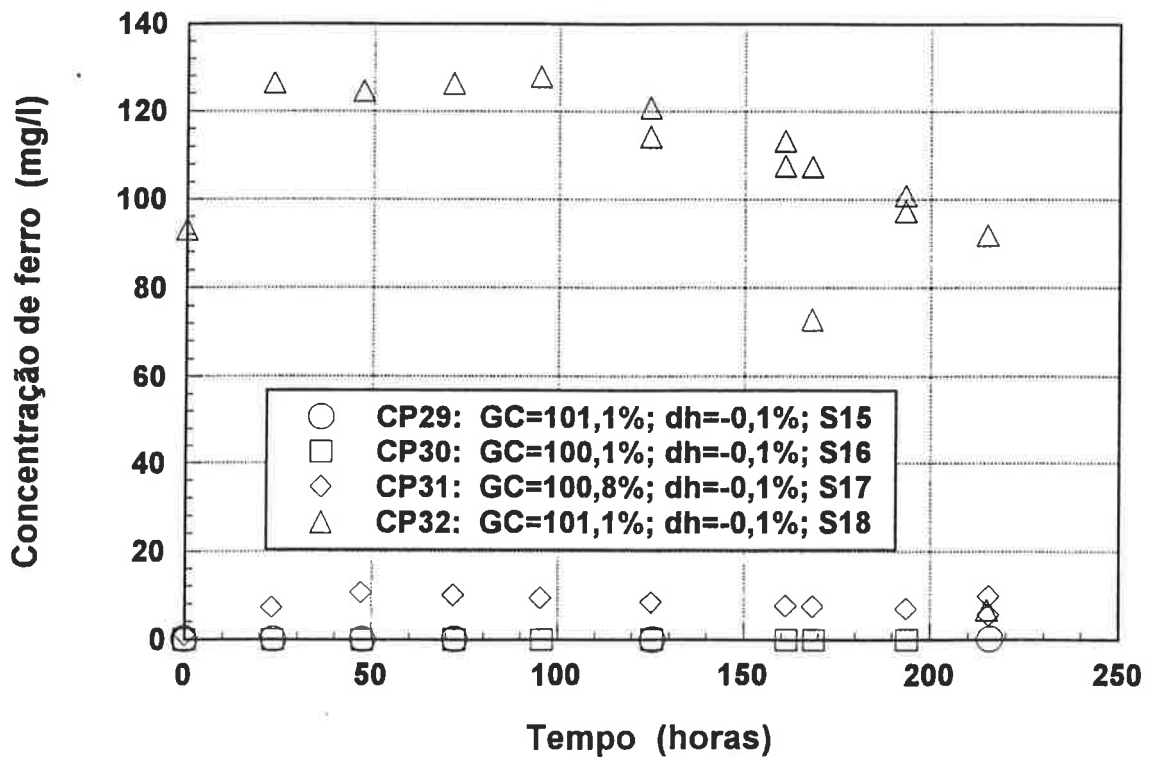
Concentração de alumínio no reservatório CPs 29 e 30



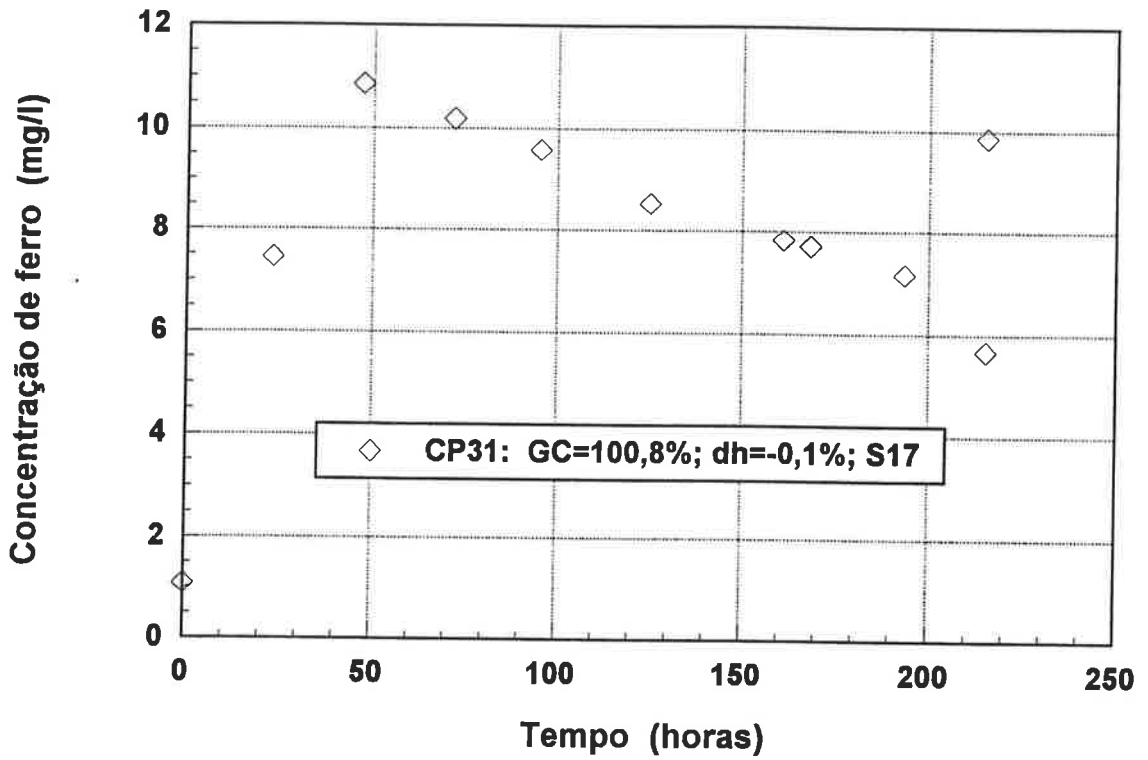
Concentração de cádmio no reservatório CPs 29, 30, 31 e 32



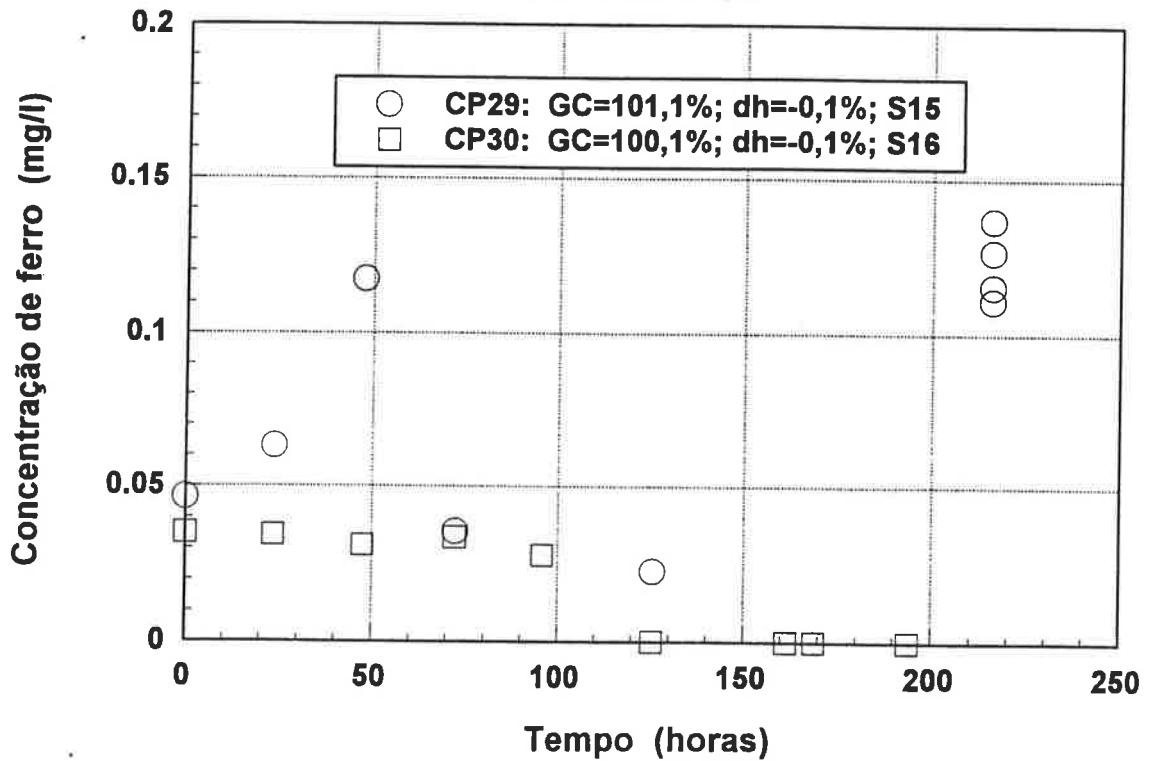
Concentração de ferro no reservatório CPs 29, 30, 31 e 32



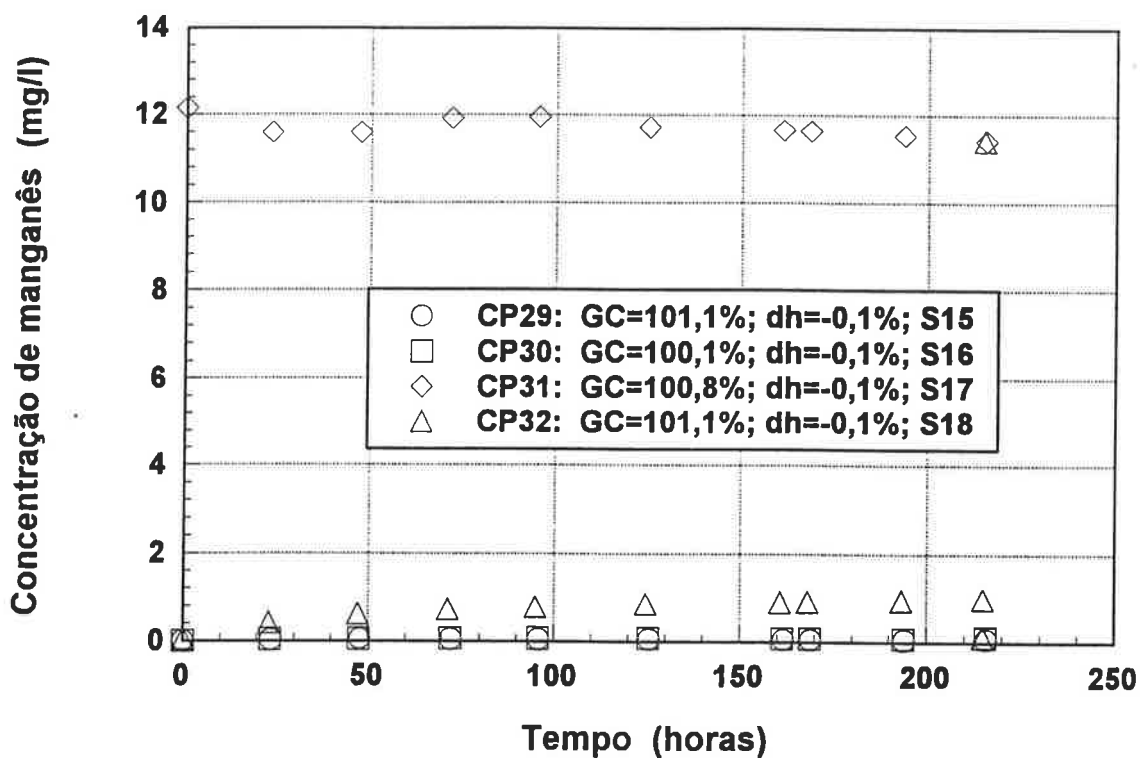
Concentração de ferro no reservatório CP 31



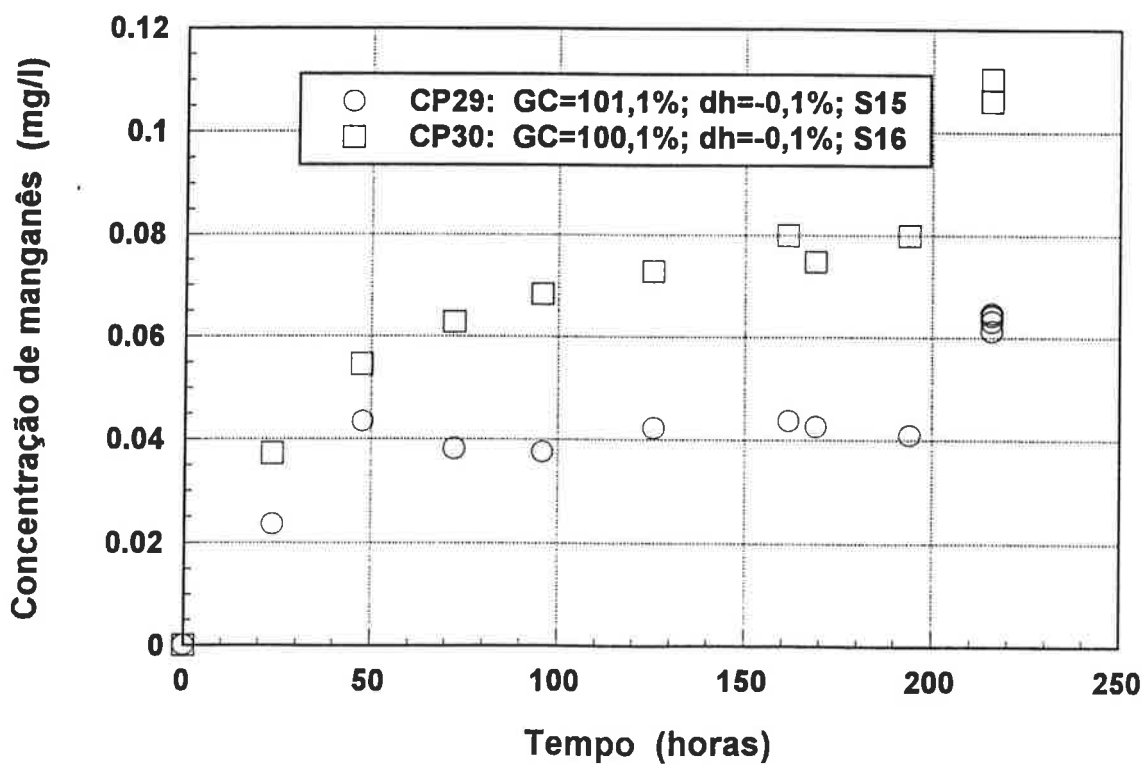
Concentração de ferro no reservatório CPs 29 e 30



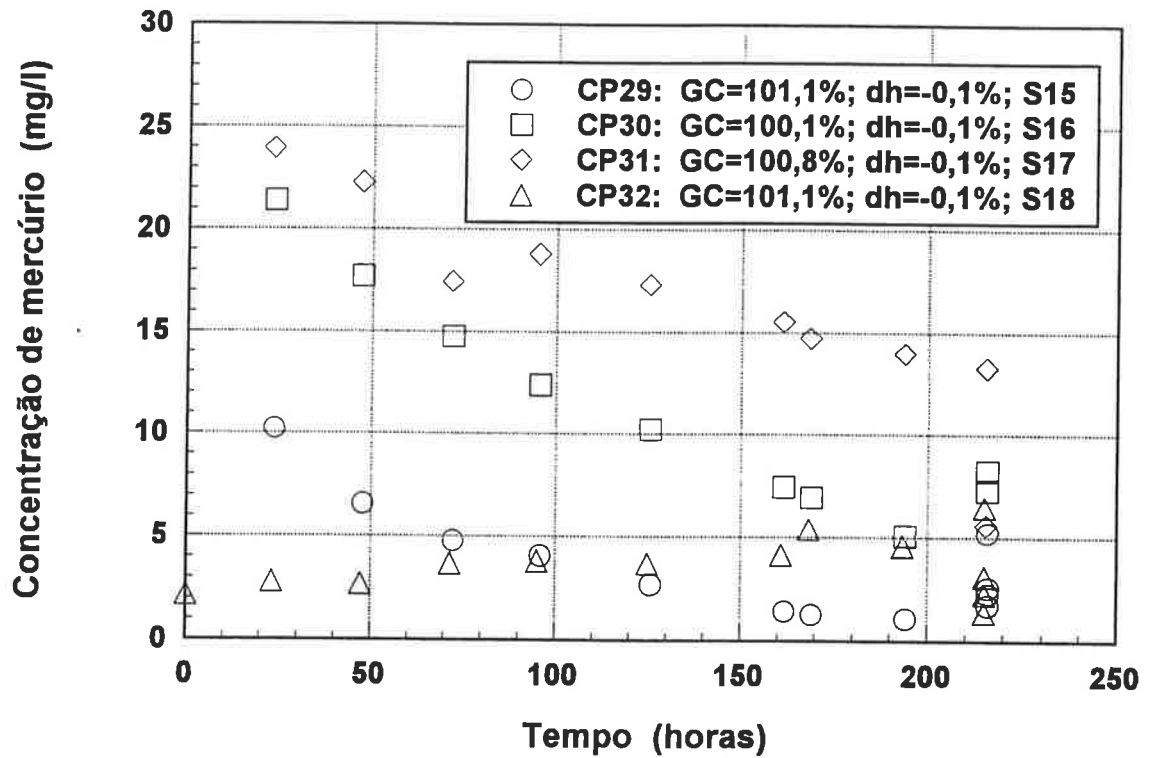
Concentração de manganês no reservatório CPs 29, 30, 31 e 32



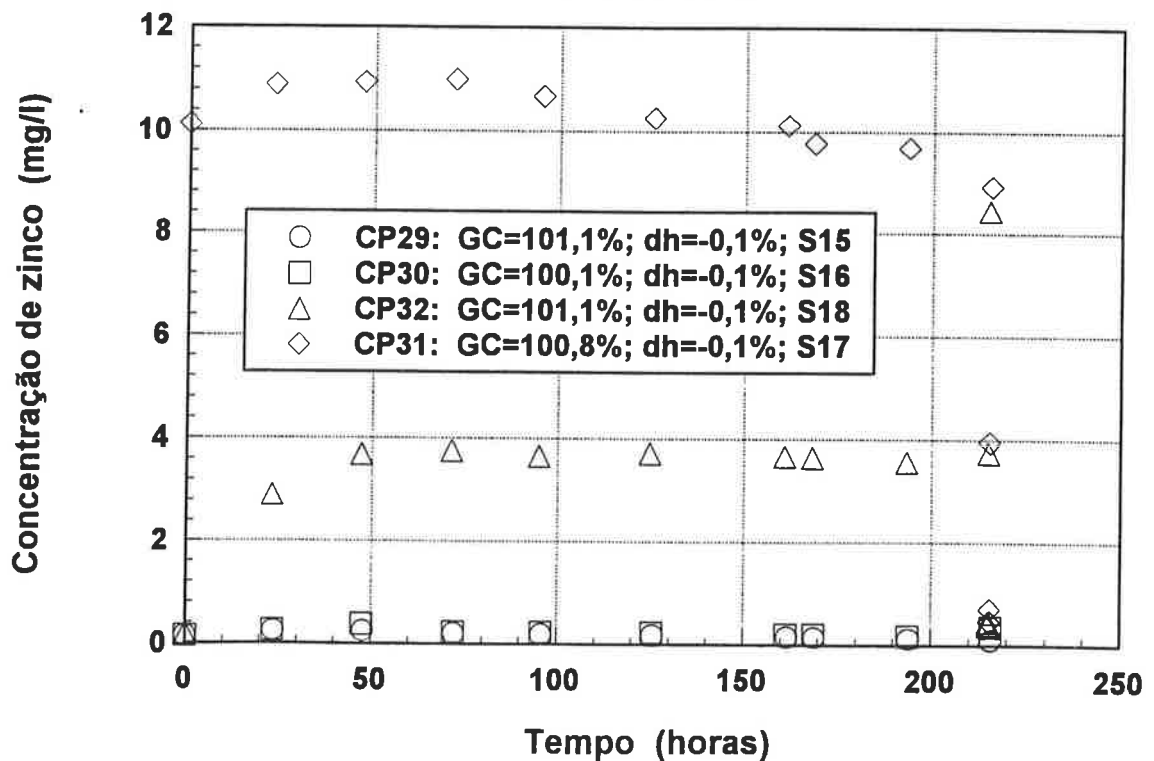
Concentração de manganês no reservatório CPs 29 e 30



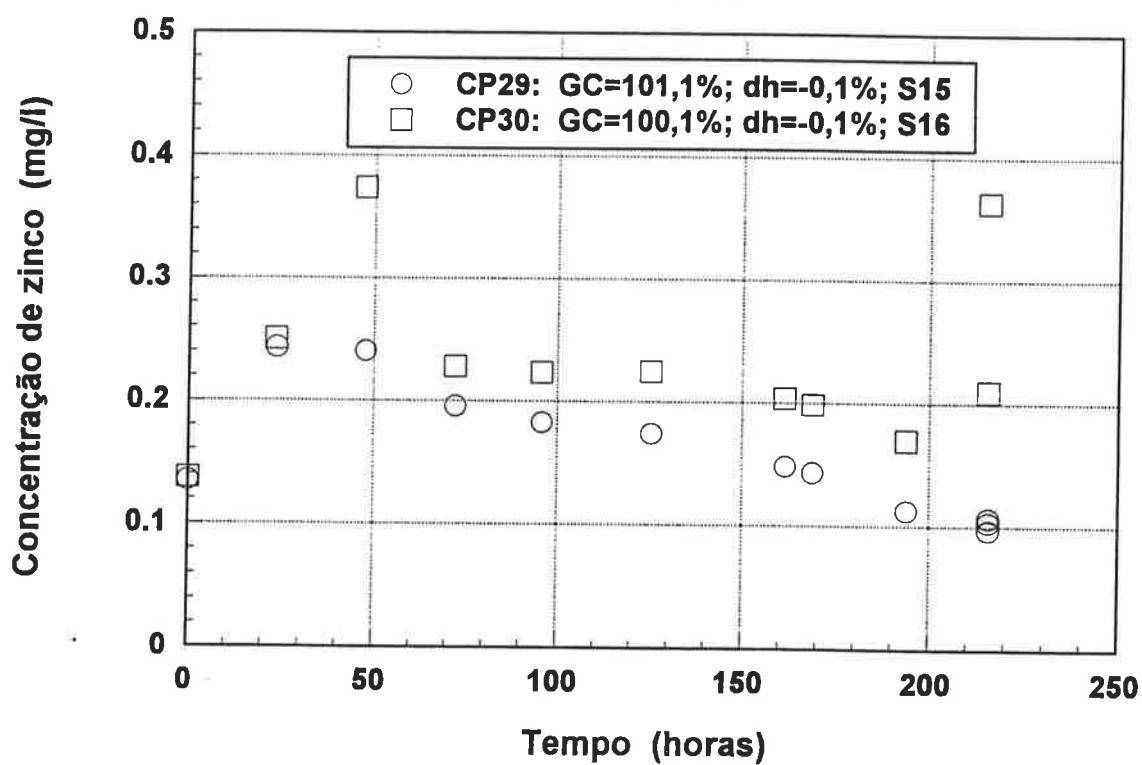
Concentração de mercúrio no reservatório CPs 29, 30, 31 e 32



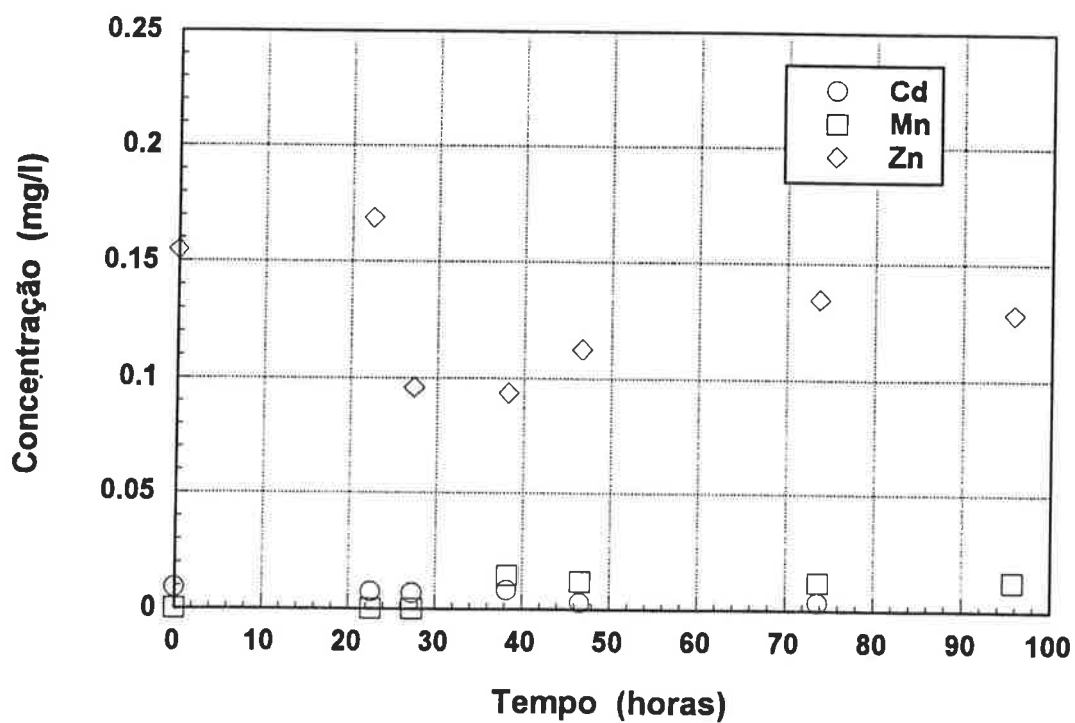
Concentração de zinco no reservatório CPs 29, 30, 31 e 32



Concentração de zinco no reservatório CPs 29 e 30



Concentração dos metais no reservatório CP "BRANCO"

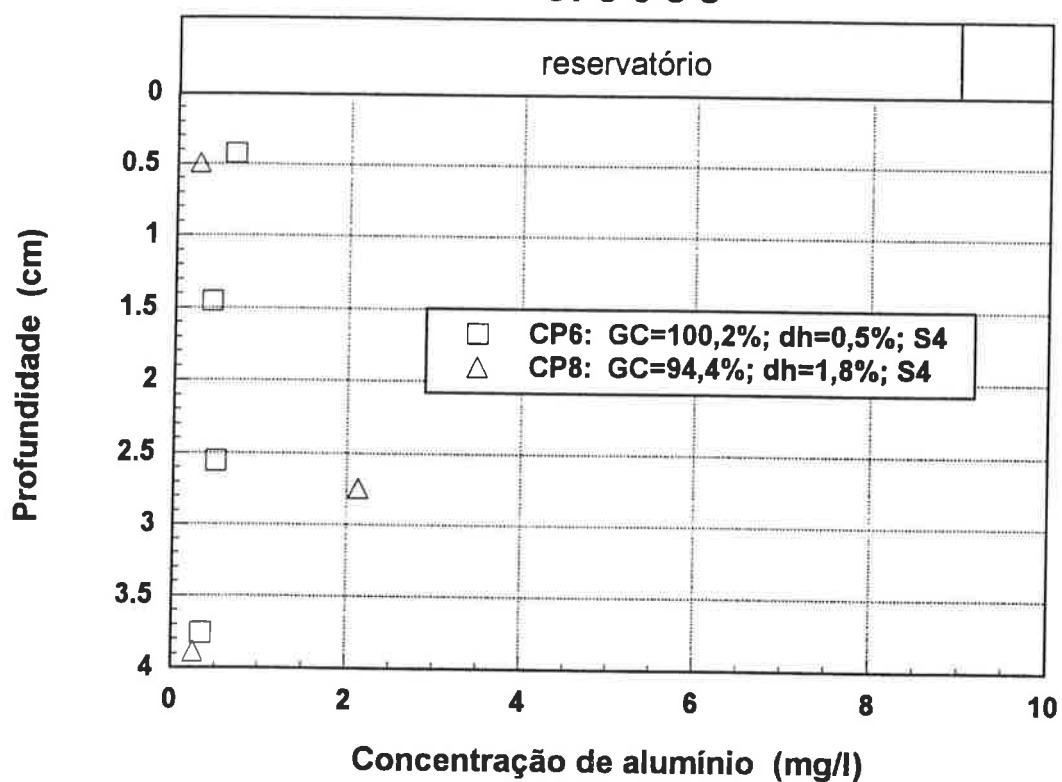


ANEXO J

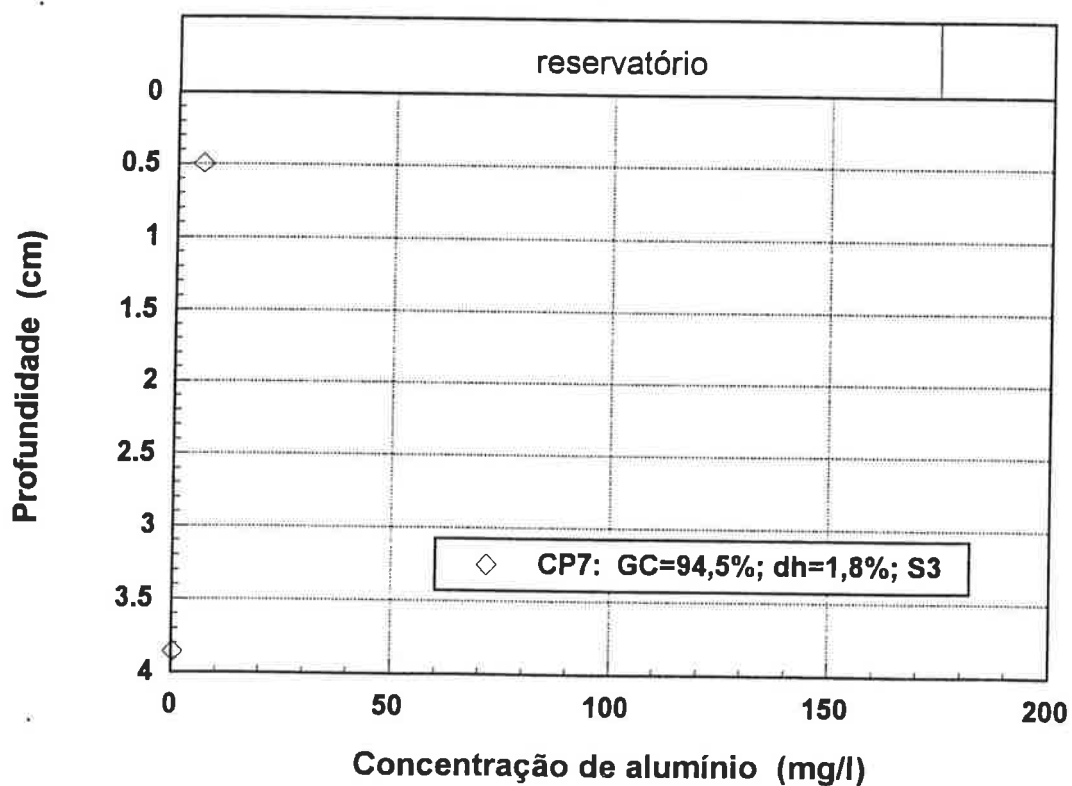
RESULTADOS DOS ENSAIOS DE DIFUSÃO

CONCENTRAÇÃO NO FLUIDO INTERSTICIAL DO CORPO-DE-PROVA EM FUNÇÃO DA PROFUNDIDADE

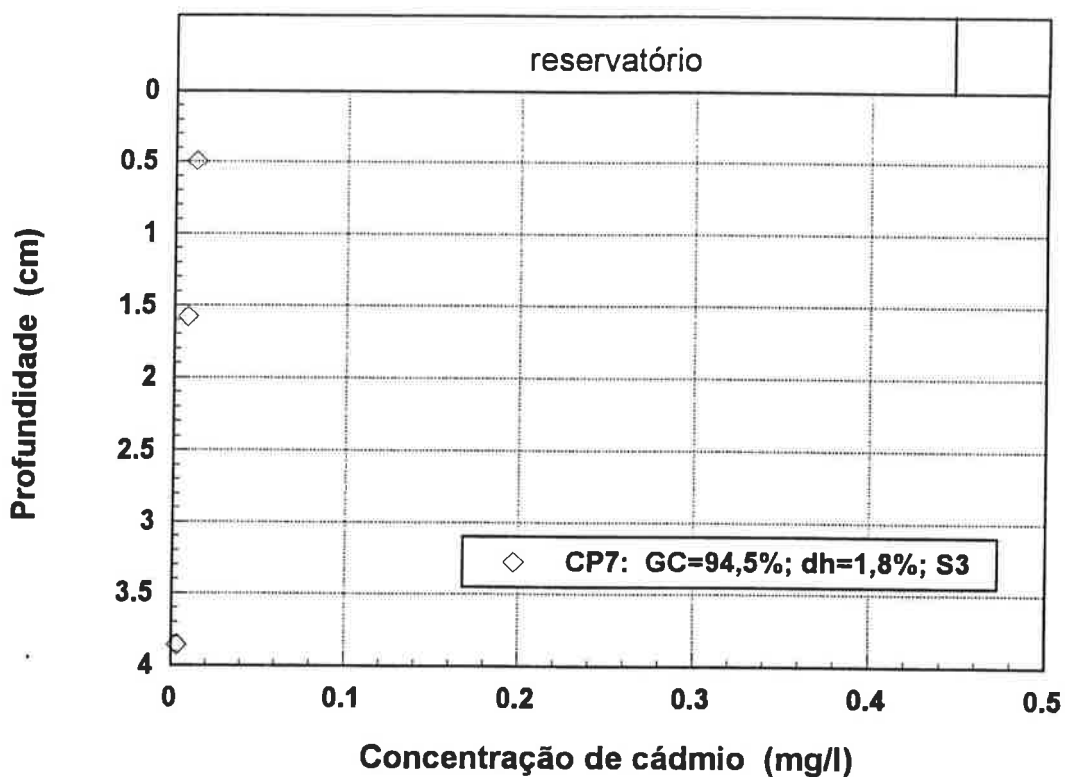
Concentração de alumínio no corpo-de-prova CPs 6 e 8



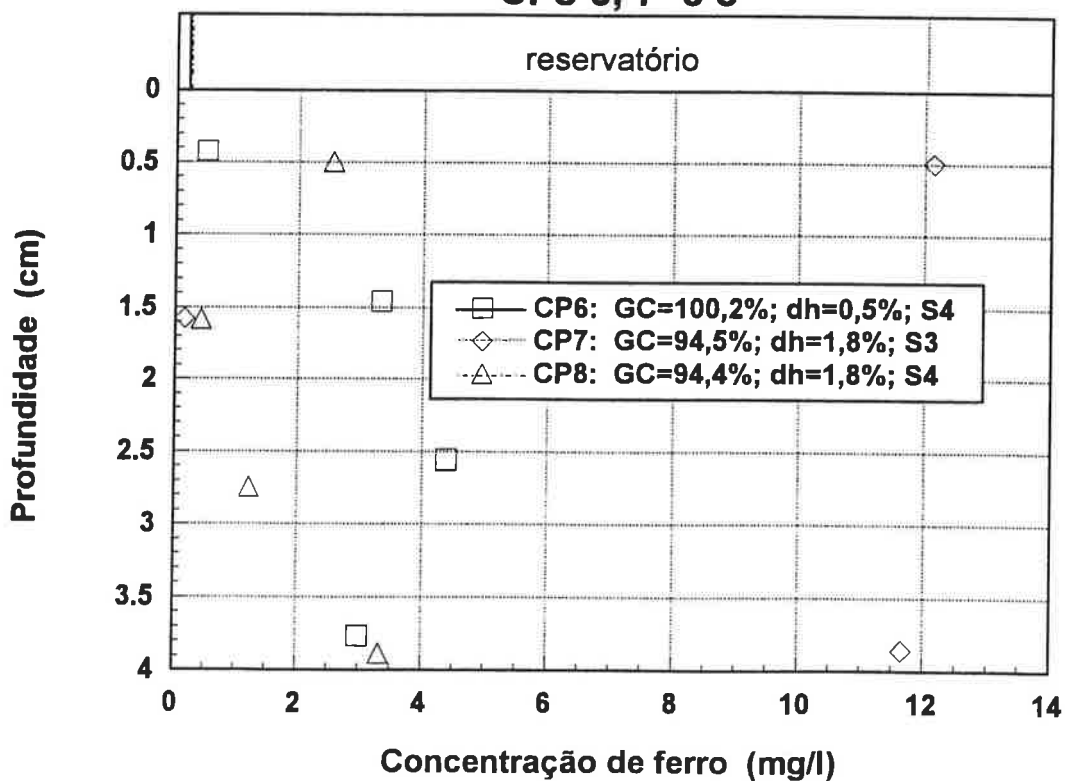
Concentração de alumínio no corpo-de-prova CP 7



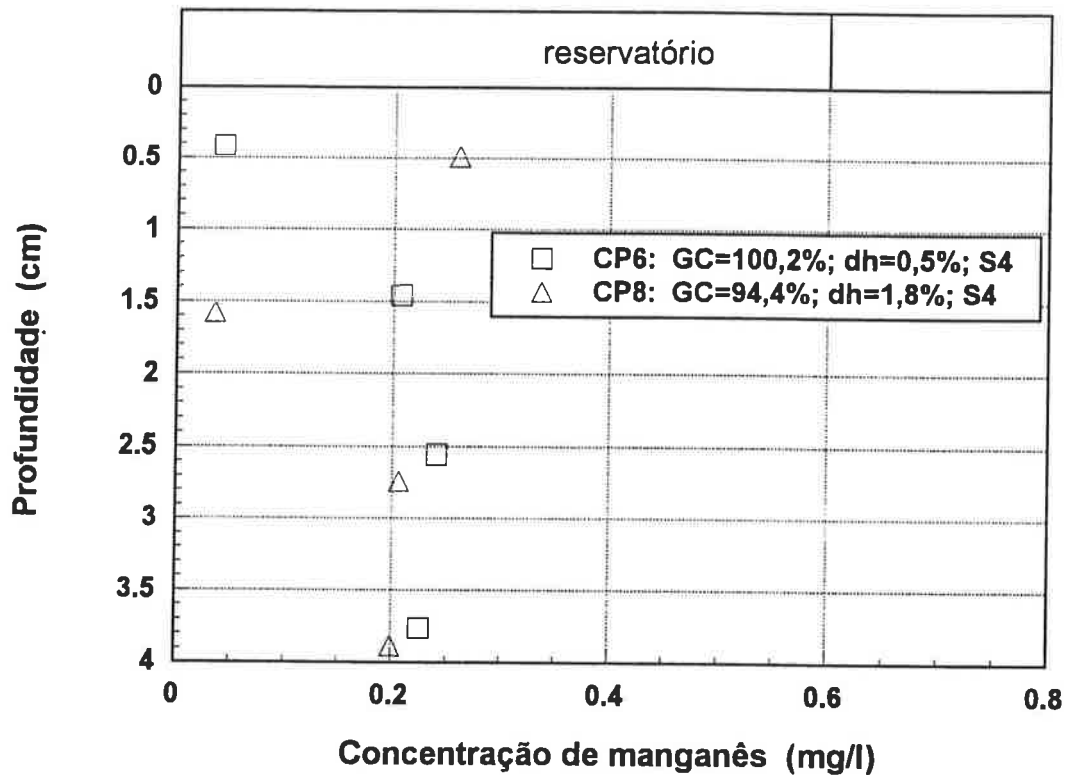
Concentração de cádmio no corpo-de-prova CP 7



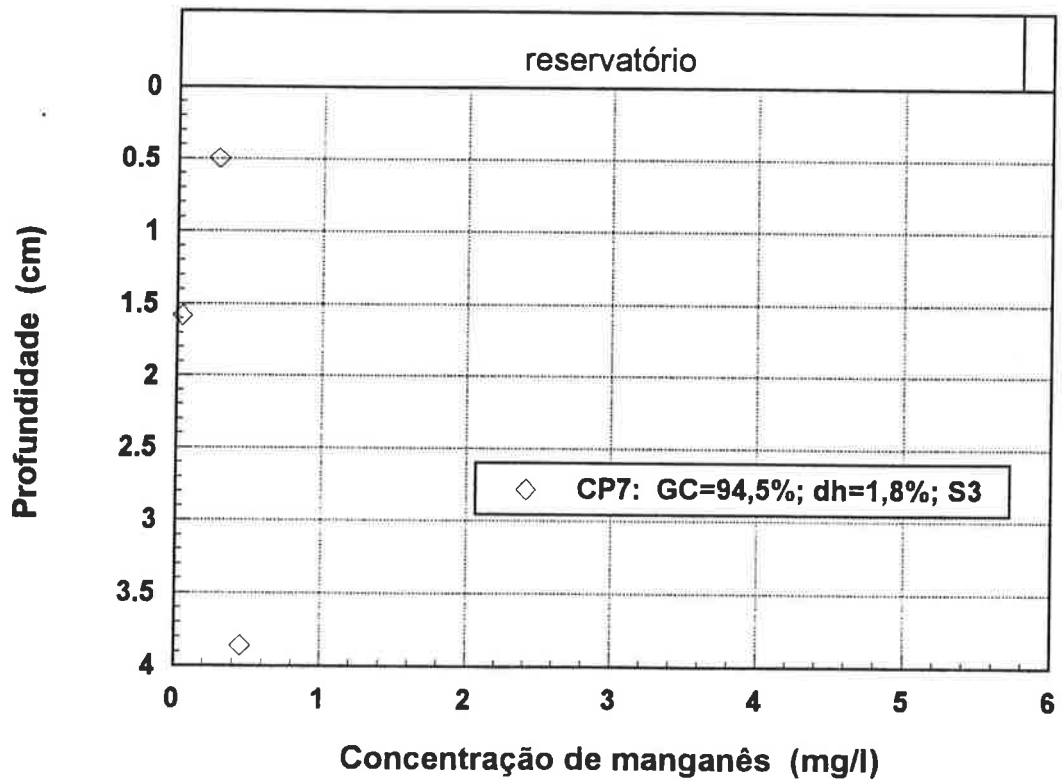
Concentração de ferro no corpo-de-prova CPs 6, 7 e 8



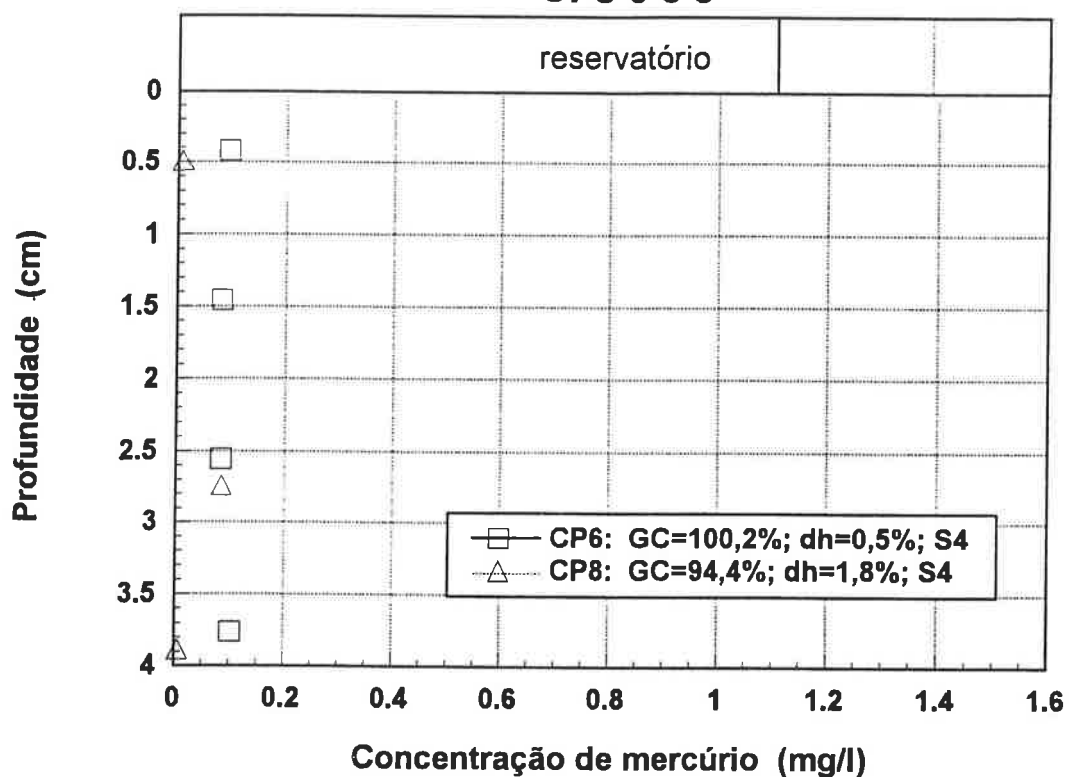
Concentração de manganês no corpo-de-prova CPs 6 e 8



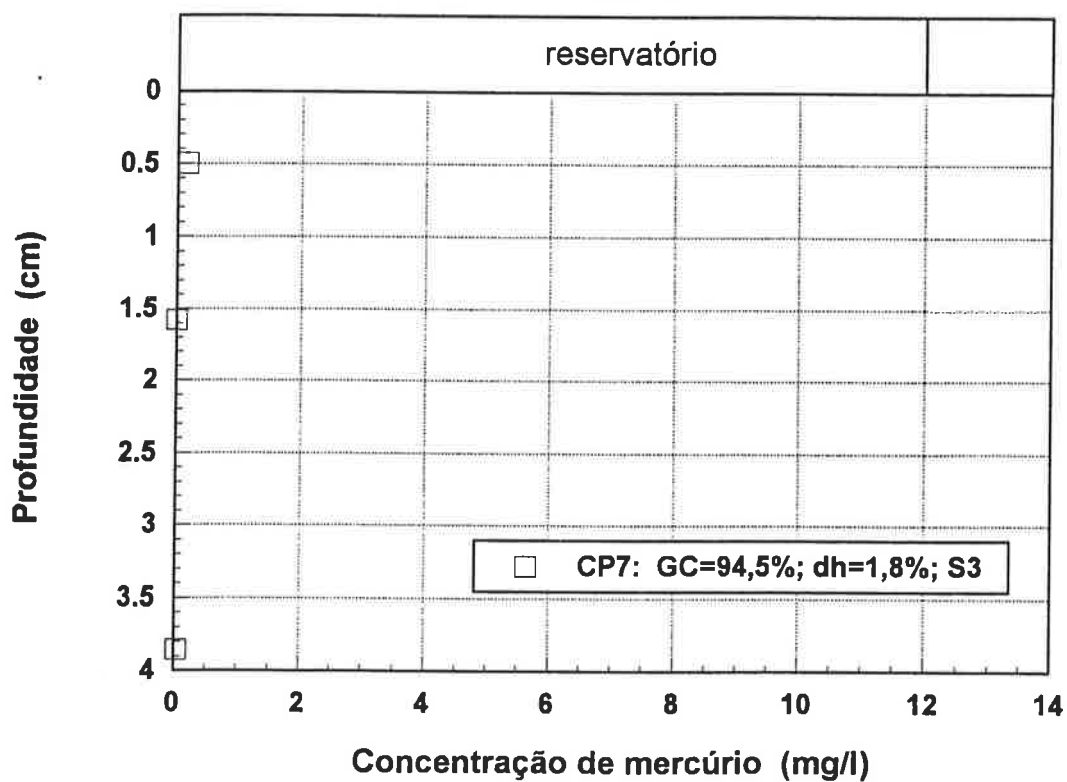
Concentração de manganês no corpo-de-prova CP 7



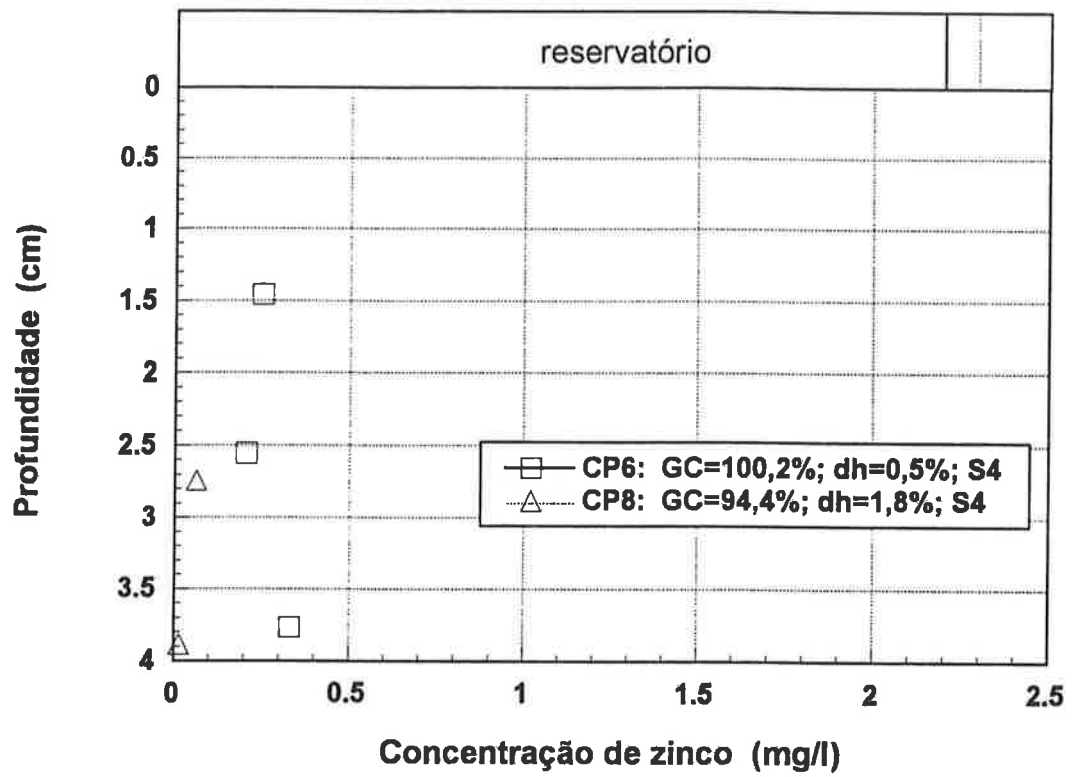
Concentração de mercúrio no corpo-de-prova CPs 6 e 8



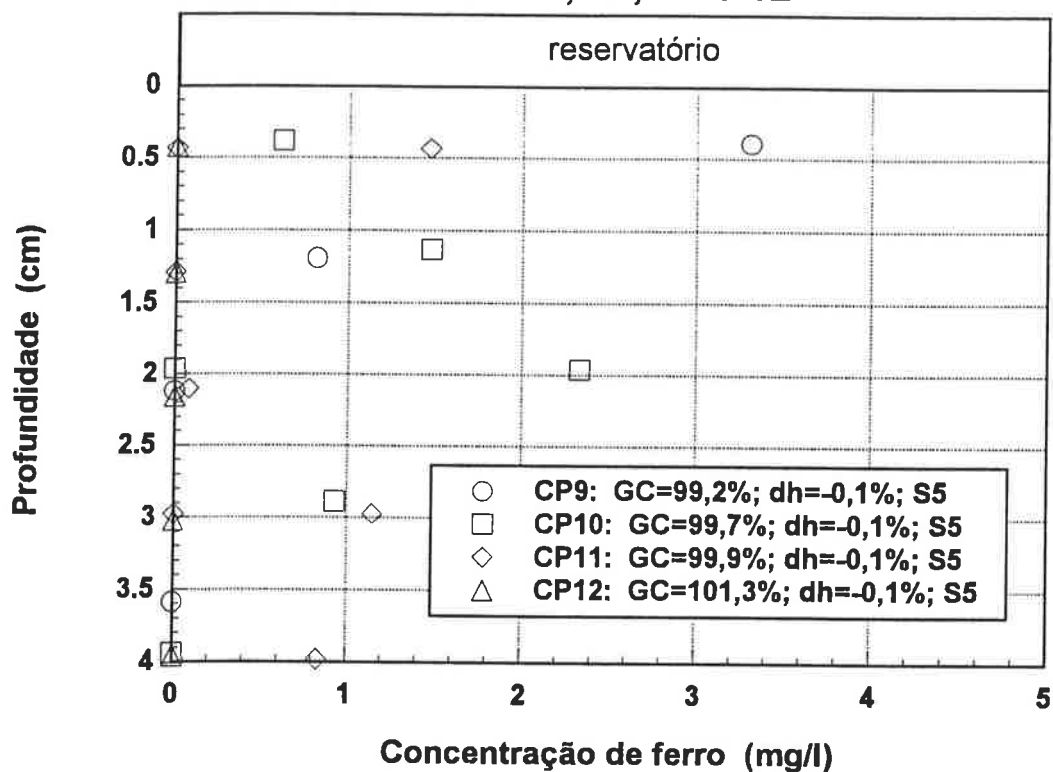
Concentração de mercúrio no corpo-de-prova CP 7



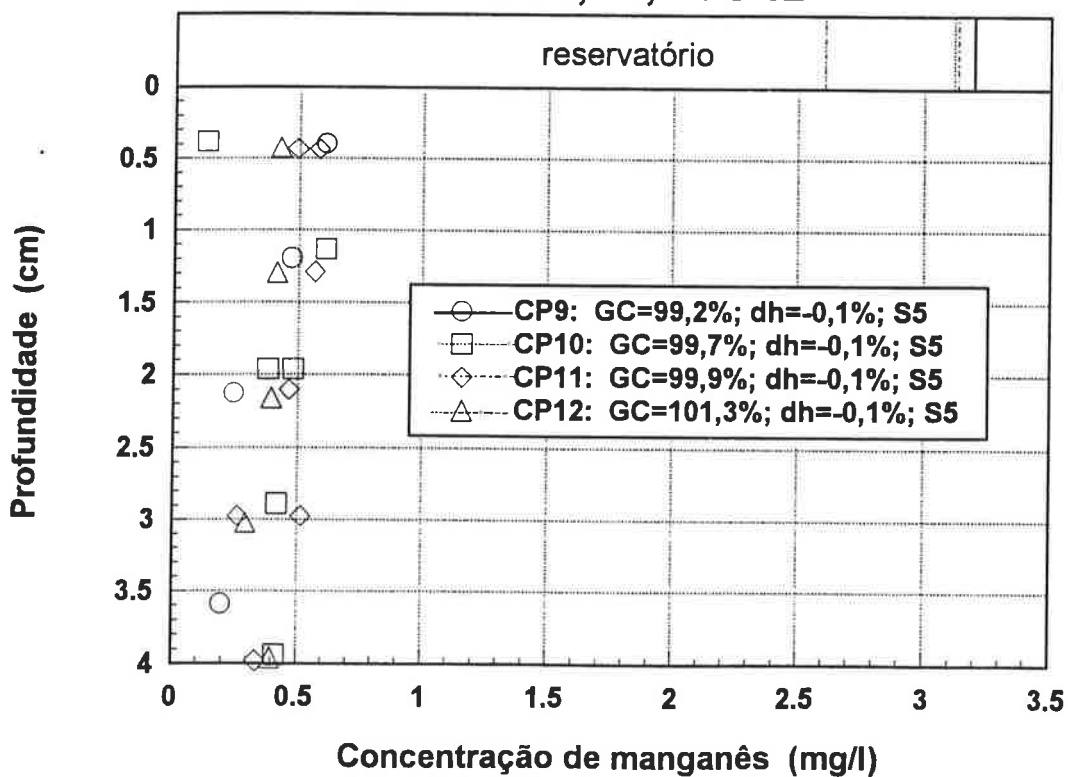
Concentração de zinco no corpo-de-prova CPs 6 e 8



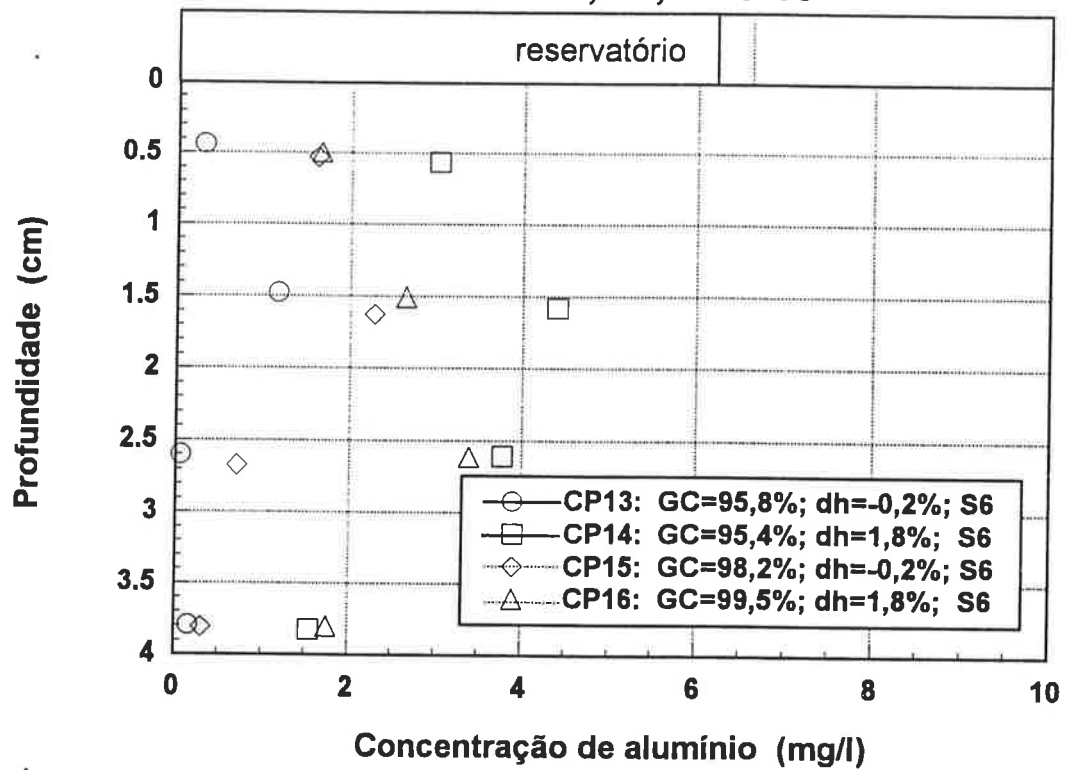
Concentração de ferro no corpo-de-prova CPs 9, 10, 11 e 12



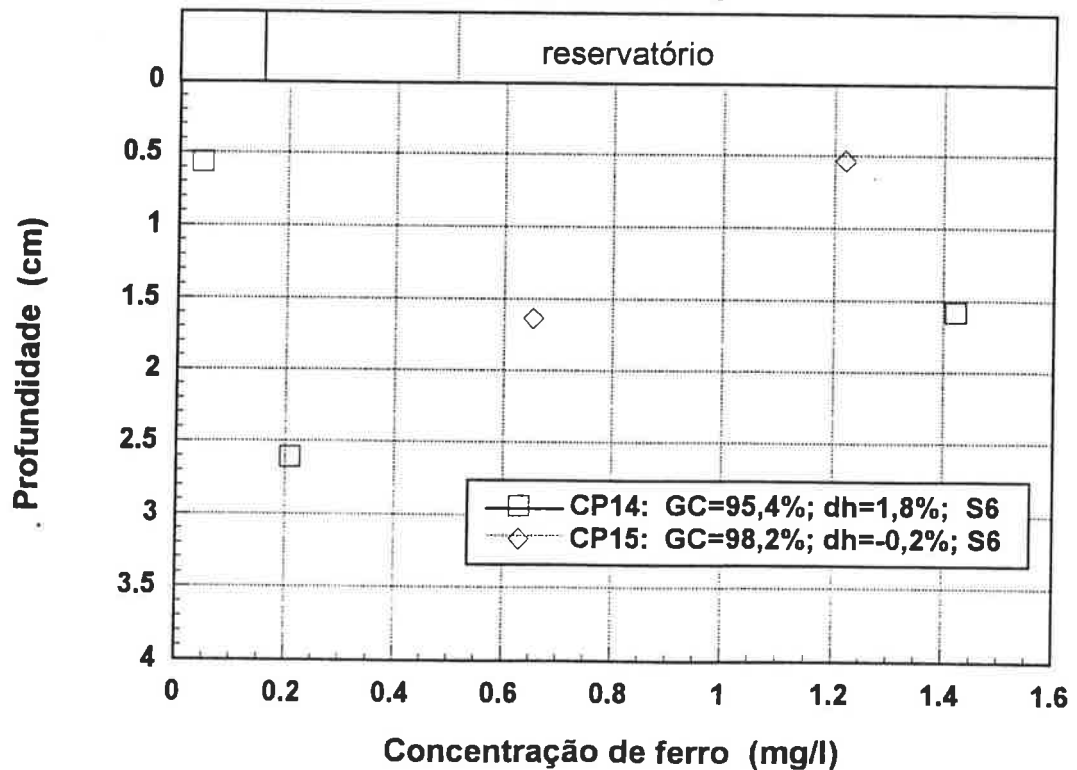
Concentração de manganês no corpo-de-prova CPs 9, 10, 11 e 12



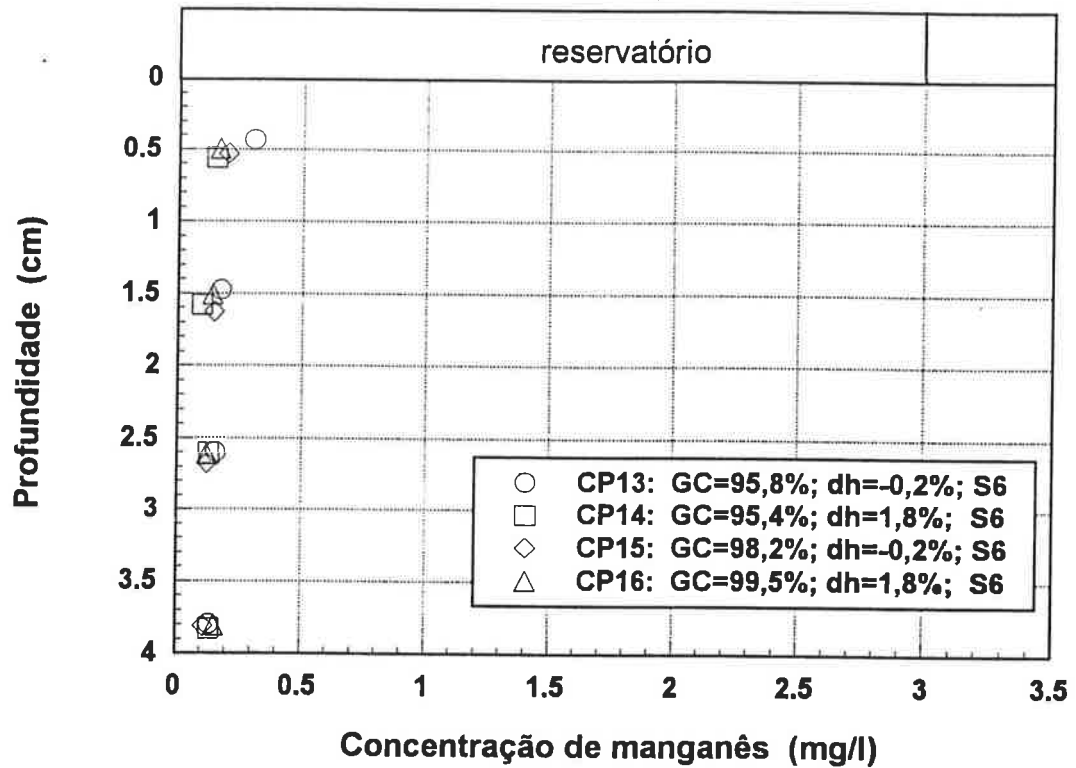
Concentração de alumínio no corpo-de-prova CPs 13, 14, 15 e 16



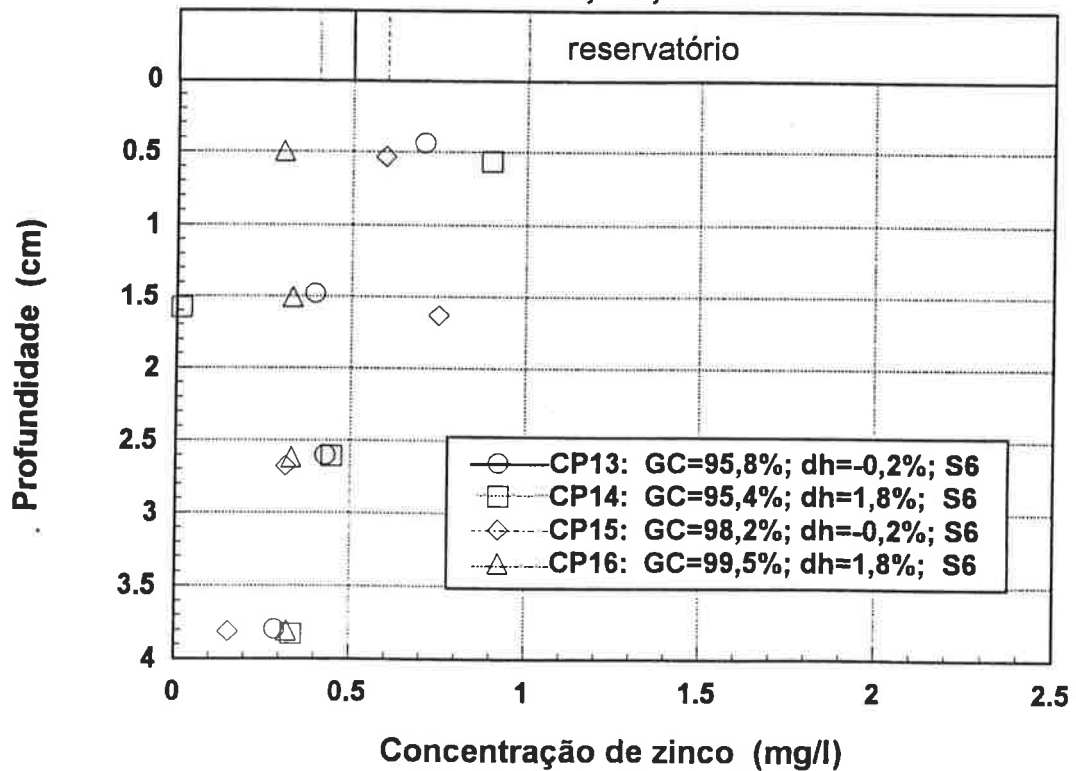
Concentração de ferro no corpo-de-prova CPs 14 e 15



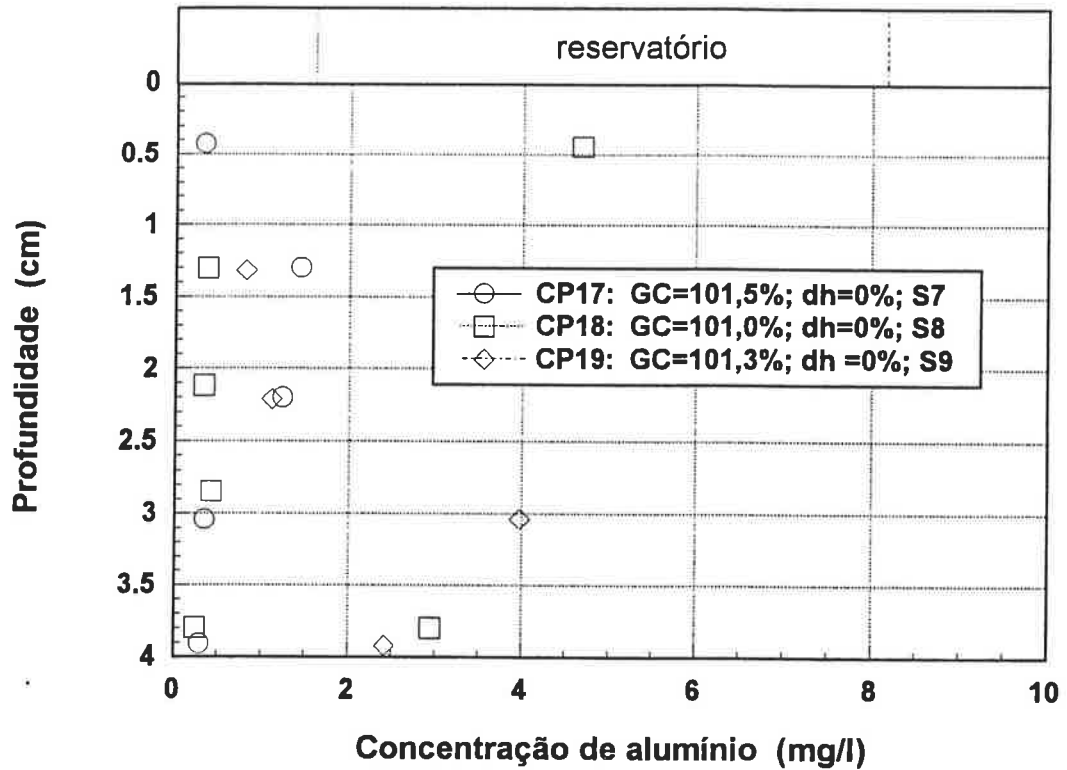
Concentração de manganês no corpo-de-prova CPs 13, 14, 15 e 16



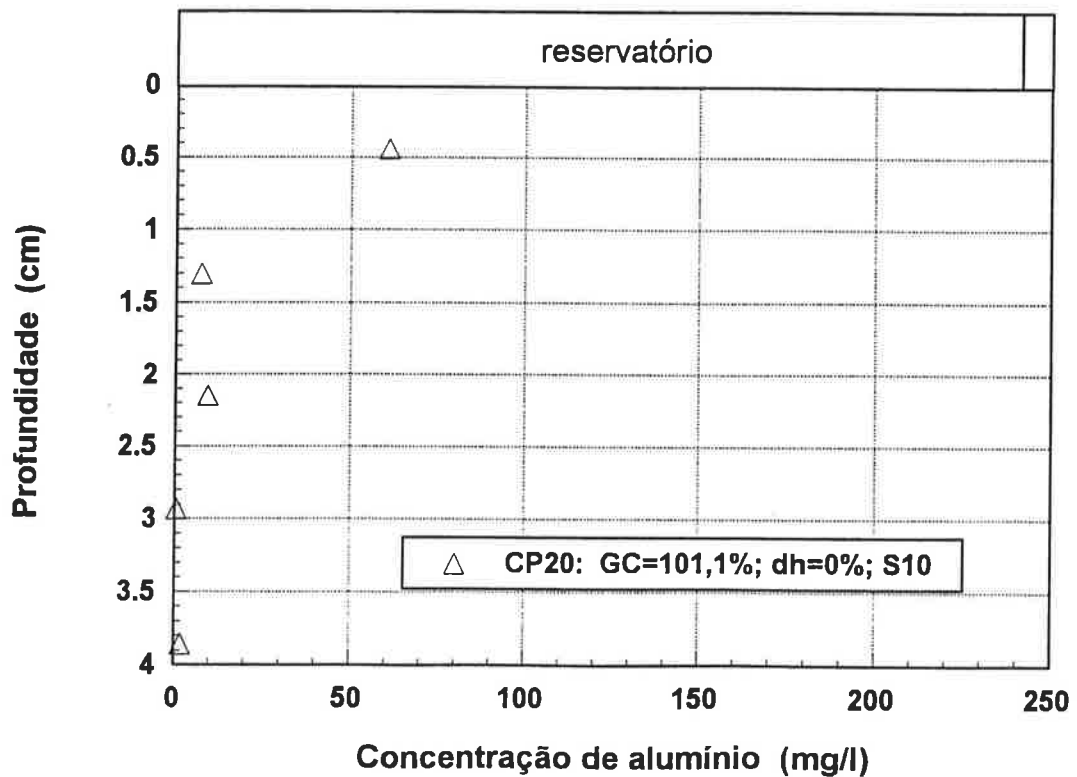
Concentração de zinco no corpo-de-prova CPs 13, 14, 15 e 16



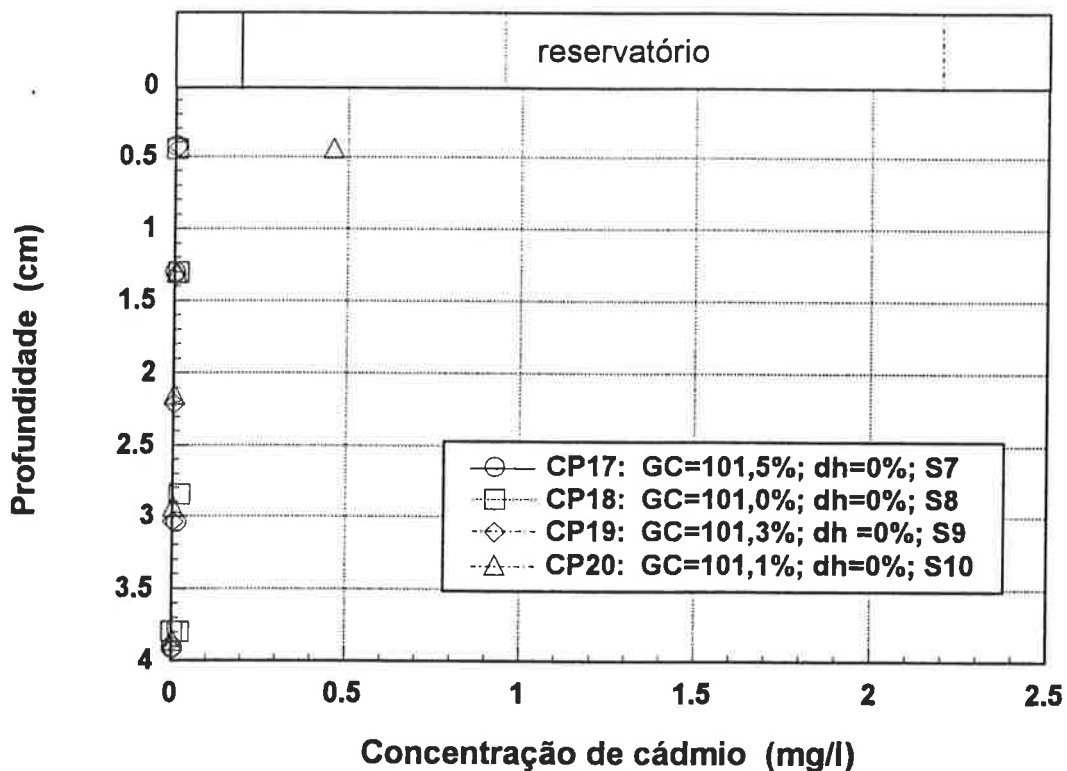
Concentração de alumínio no corpo-de-prova CPs 17, 18 e 19



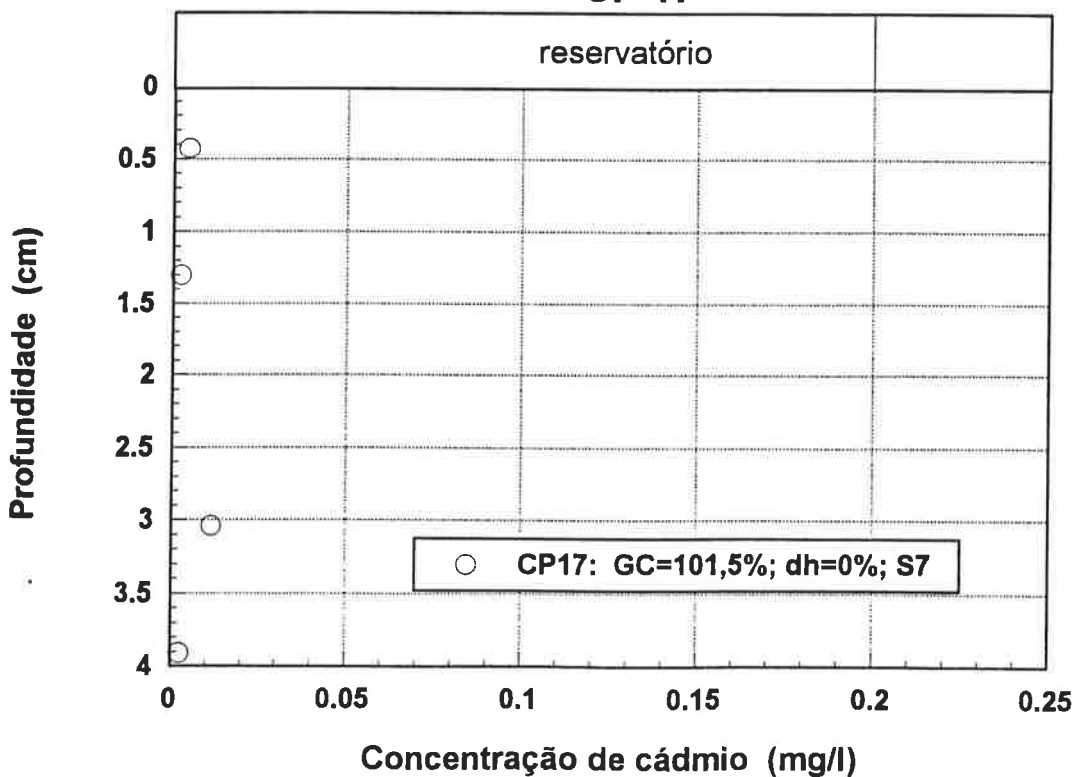
Concentração de alumínio no corpo-de-prova CP 20



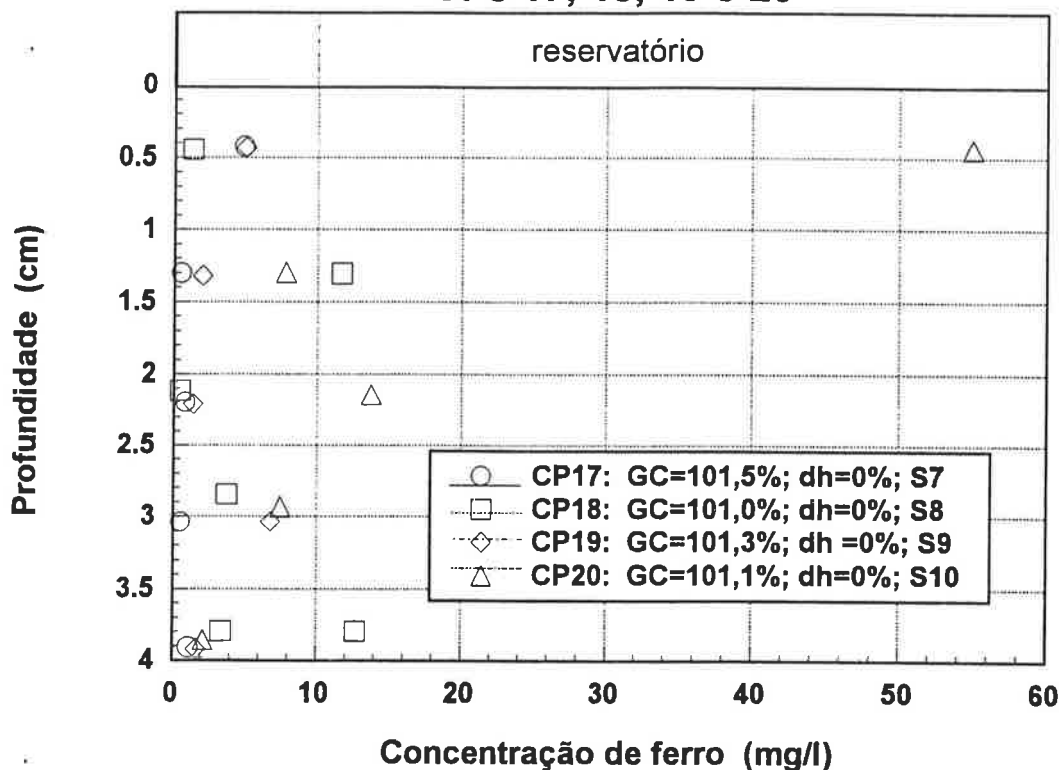
Concentração de cádmio no corpo-de-prova CPs 17, 18, 19 e 20



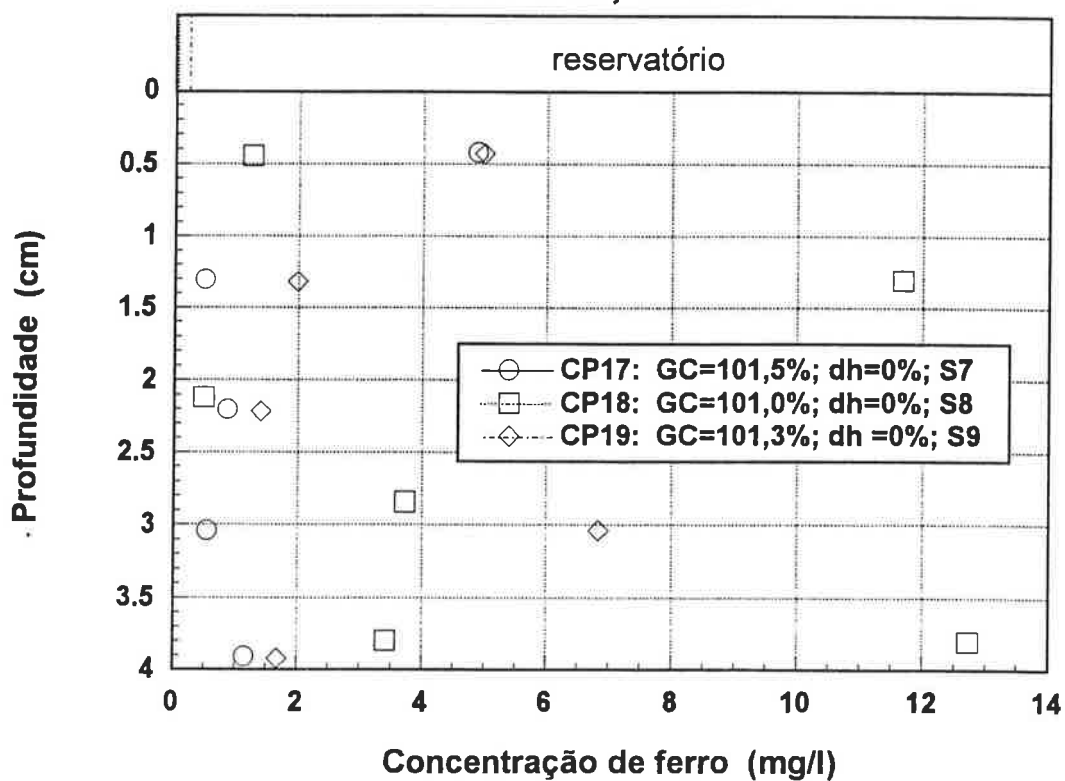
Concentração de cádmio no corpo-de-prova CP 17



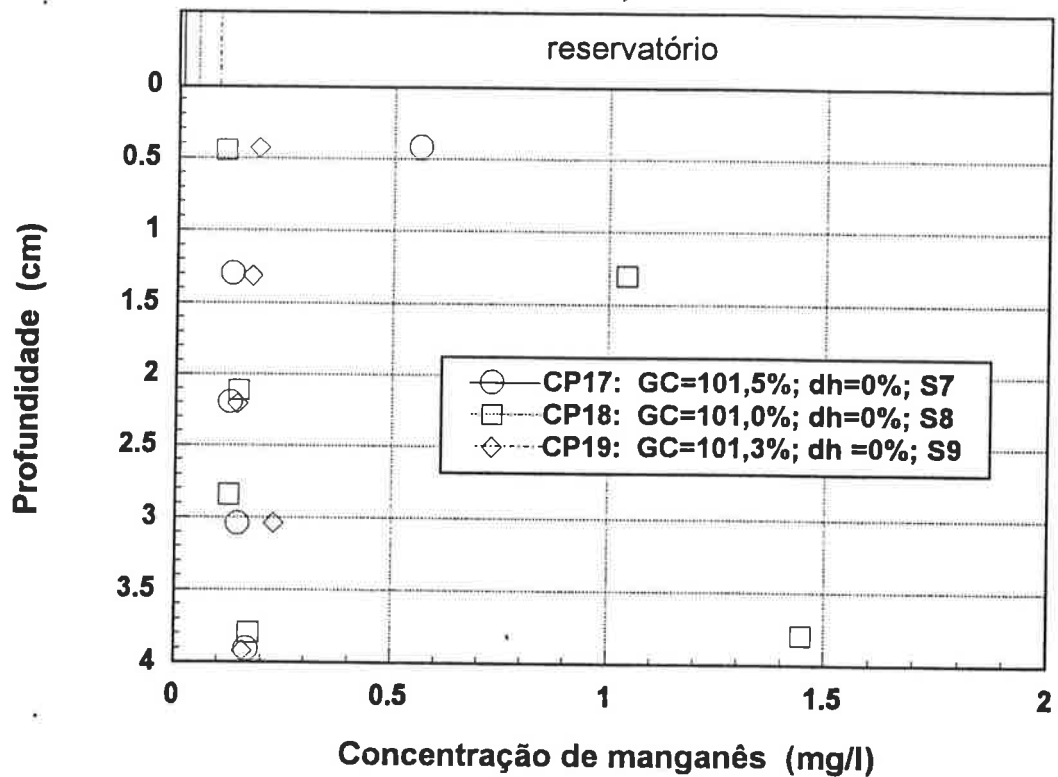
Concentração de ferro no corpo-de-prova CPs 17, 18, 19 e 20



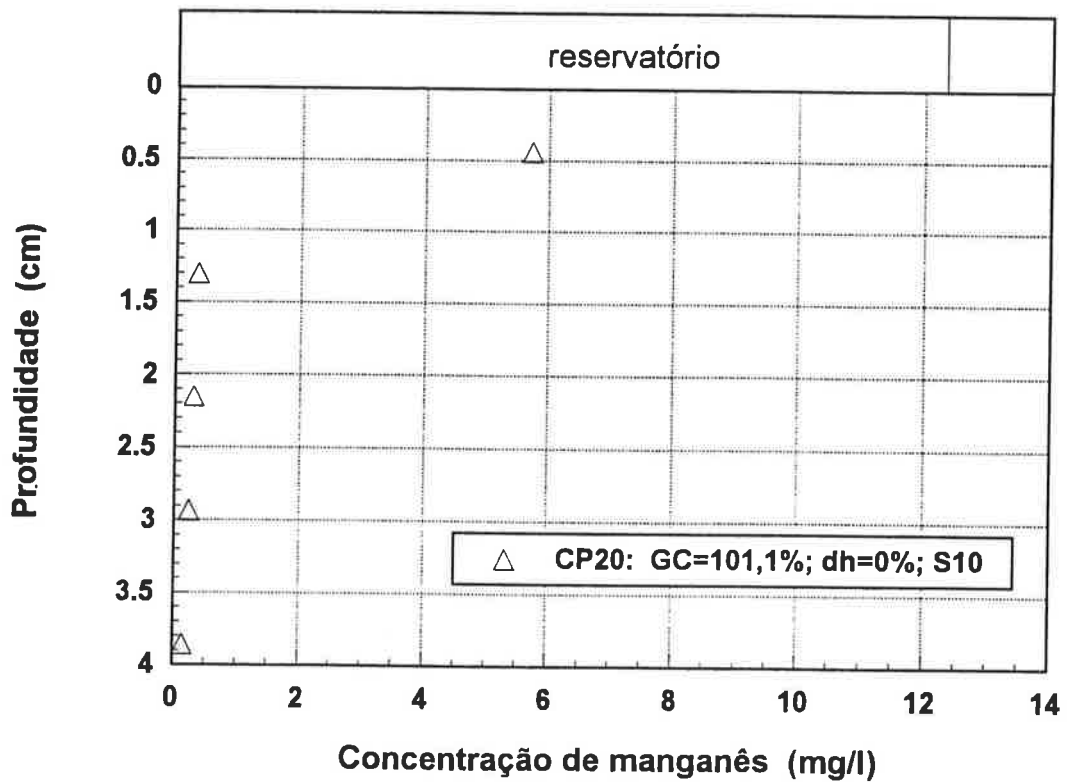
Concentração de ferro no corpo-de-prova CPs 17, 18 e 19



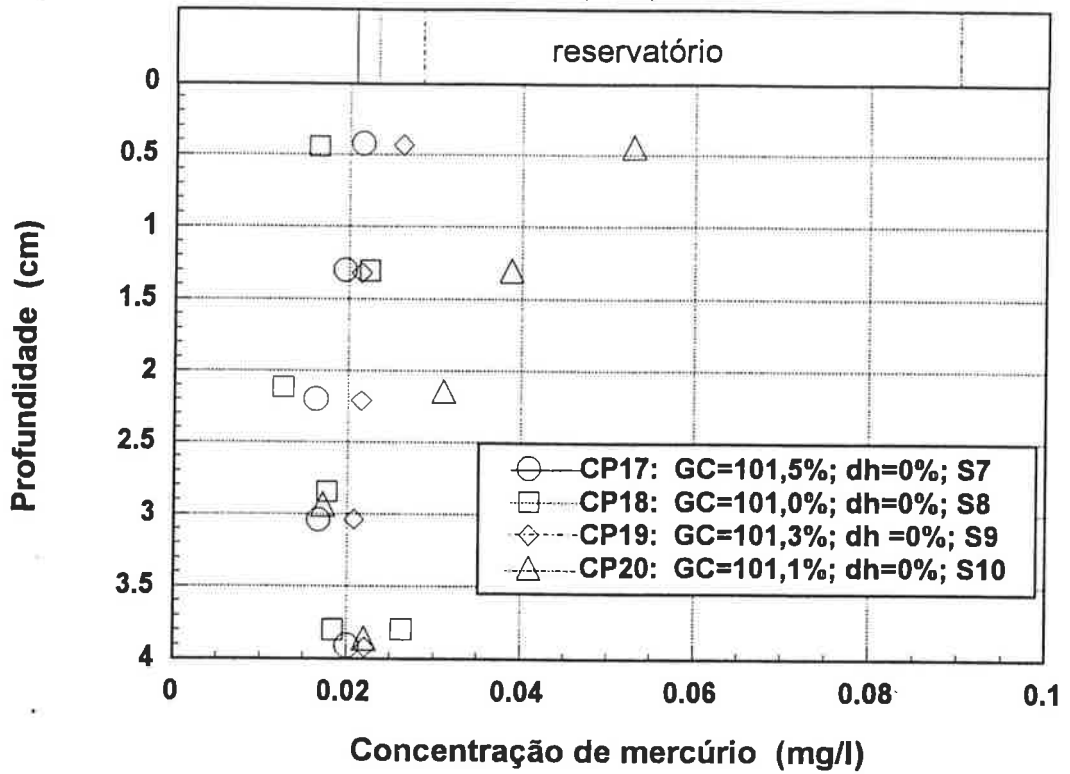
Concentração de manganês no corpo-de-prova CPs 17, 18 e 19



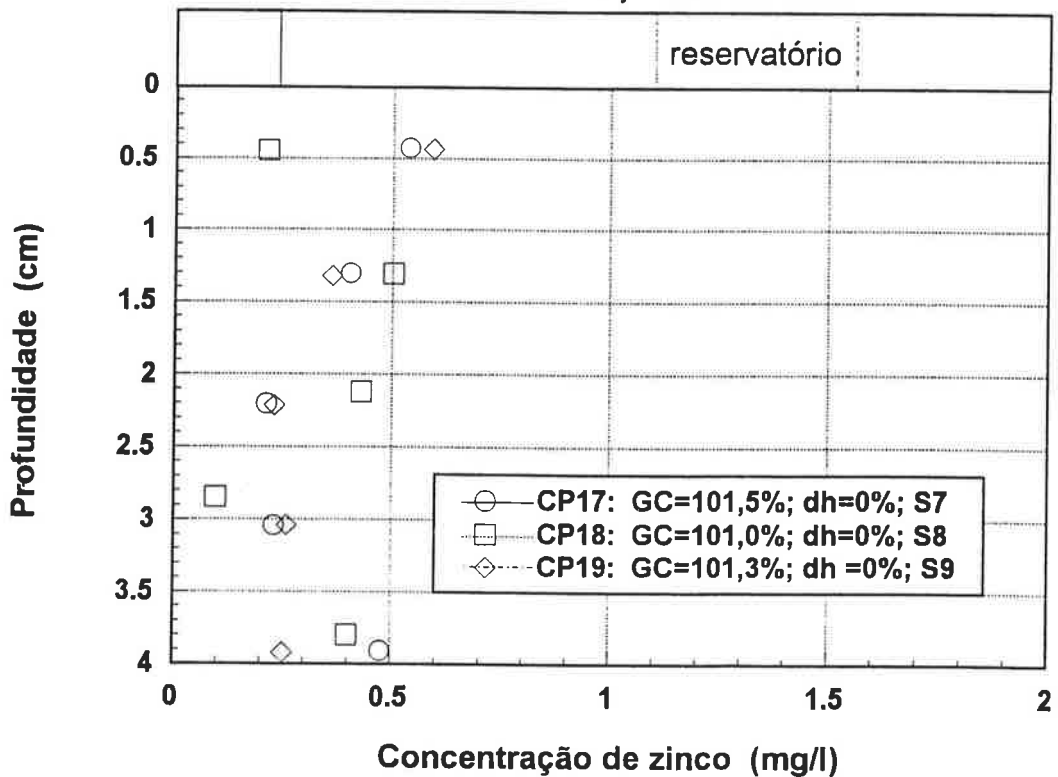
Concentração de manganês no corpo-de-prova CP 20



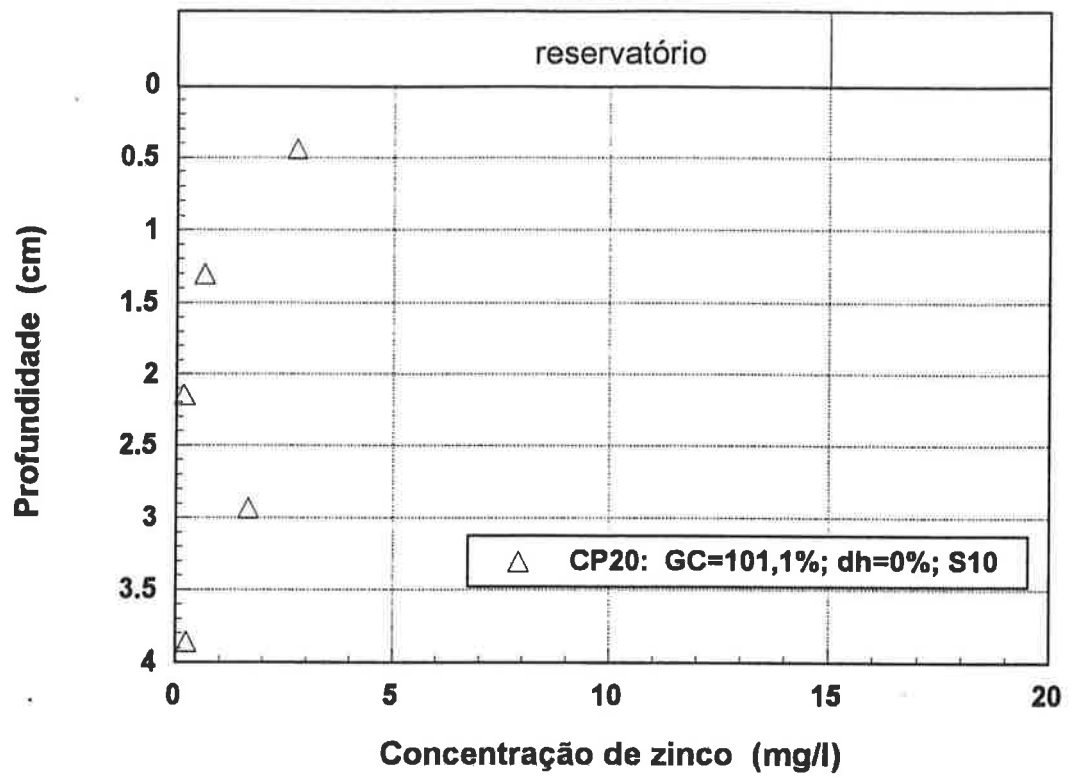
Concentração de mercúrio no corpo-de-prova CPs 17, 18, 19 e 20



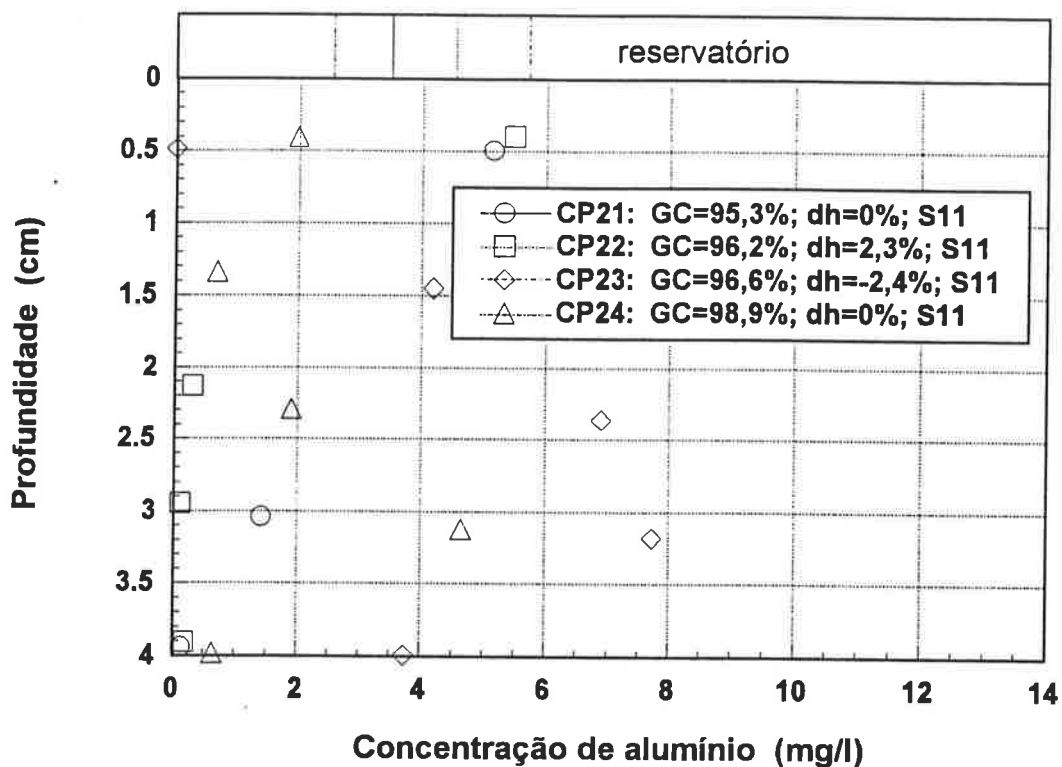
Concentração de zinco no corpo-de-prova CPs 17, 18 e 19



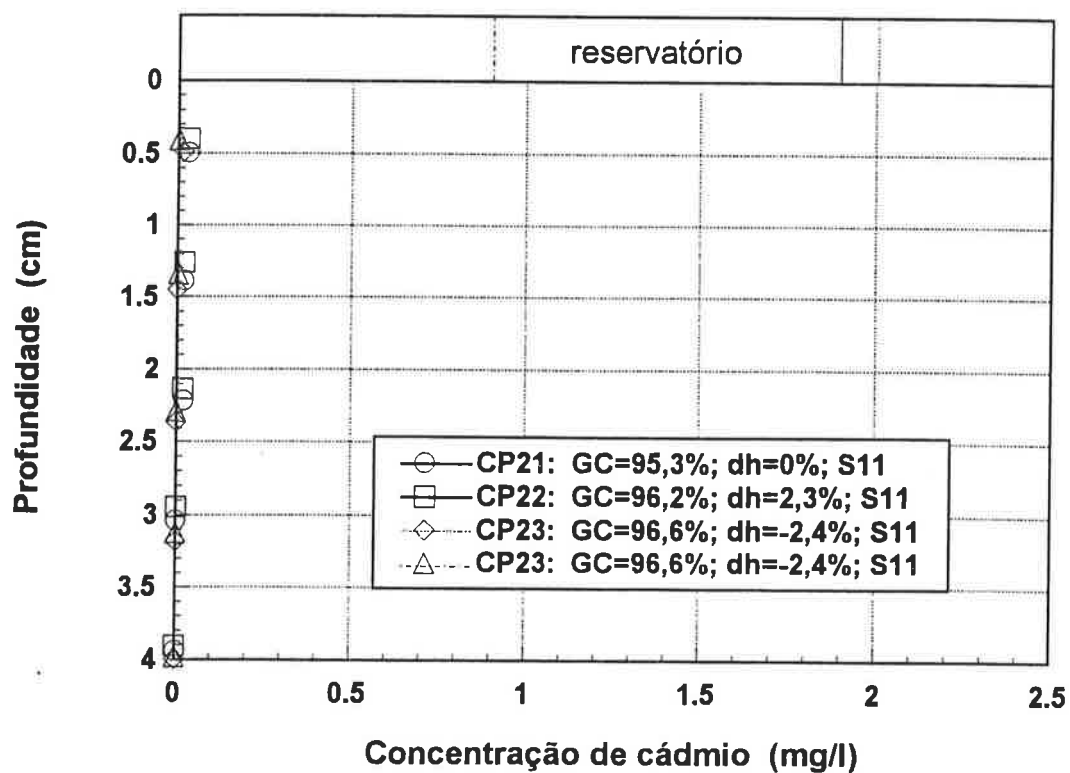
Concentração de zinco no corpo-de-prova CP 20



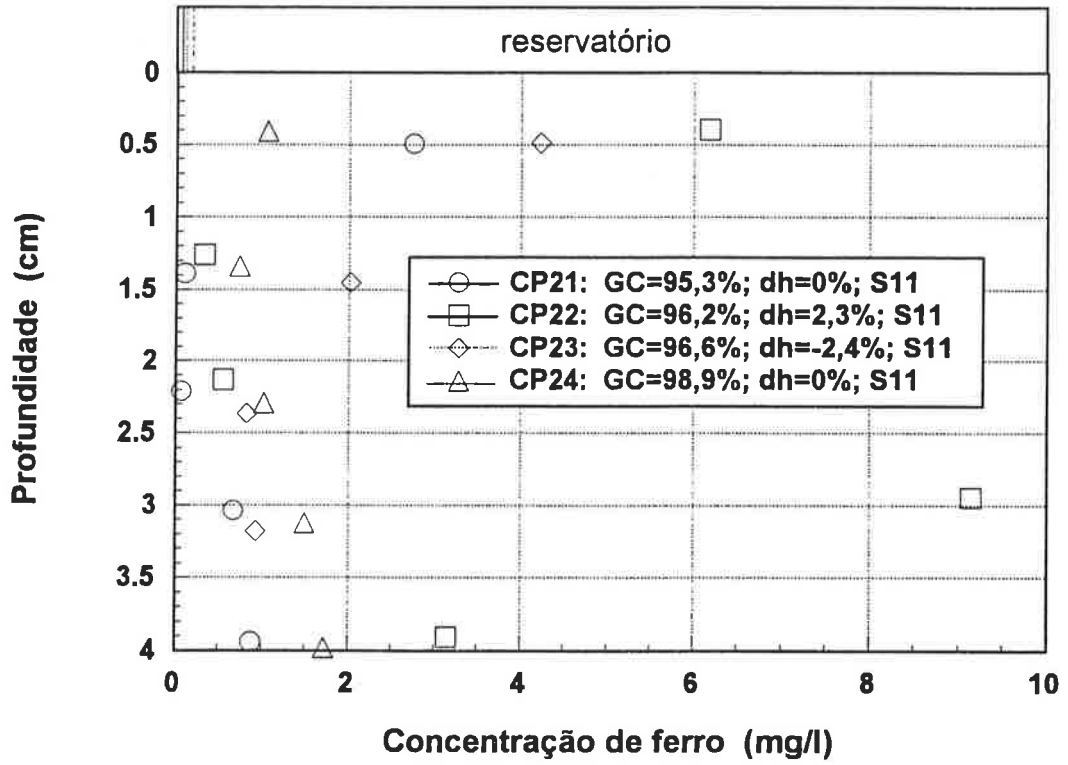
Concentração de alumínio no corpo-de-prova CPs 21, 22, 23 e 24



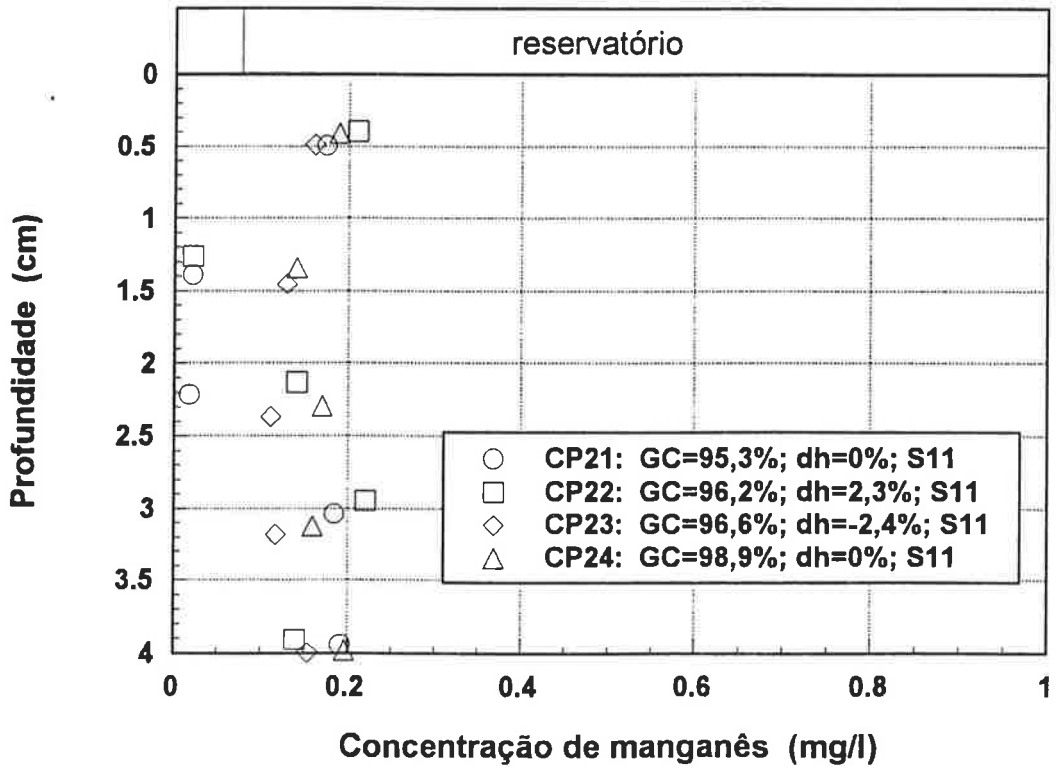
Concentração de cádmio no corpo-de-prova CPs 21, 22, 23 e 24



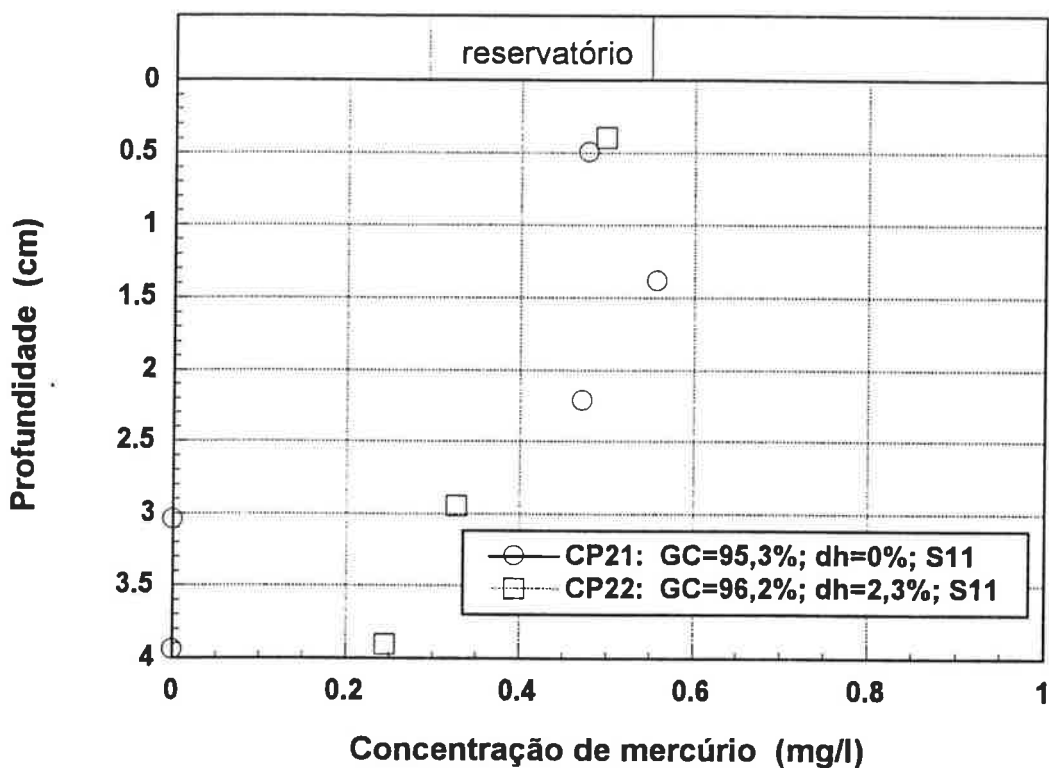
Concentração de ferro no corpo-de-prova CPs 21, 22, 23 e 24



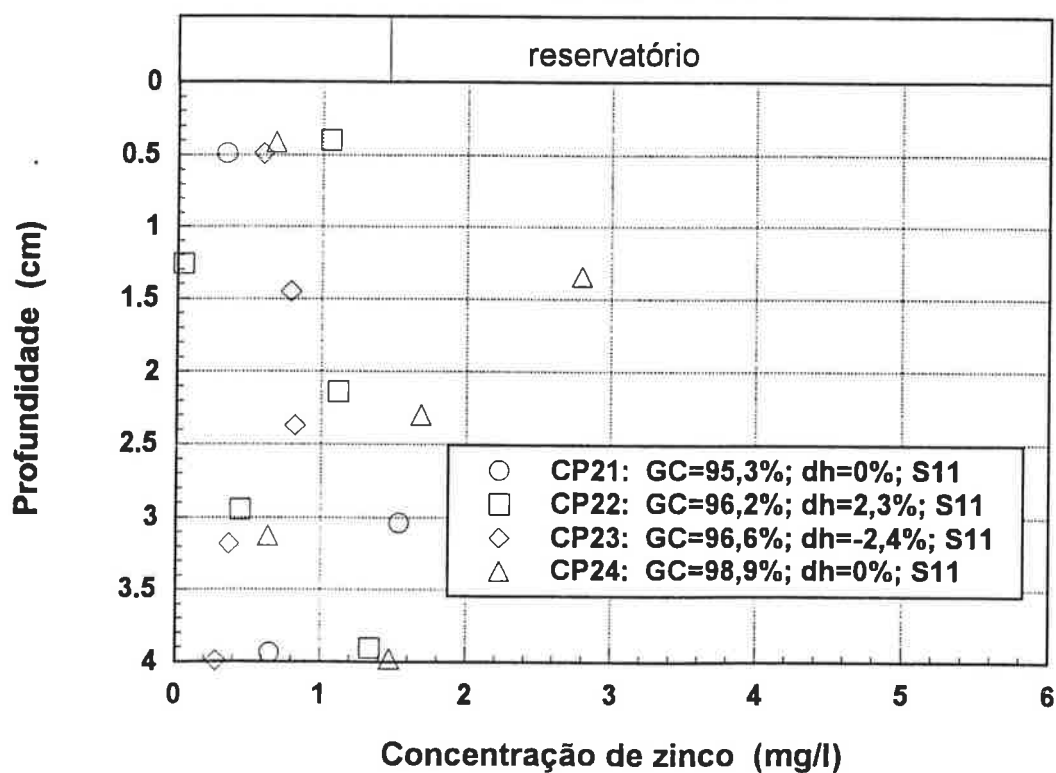
Concentração de manganês no corpo-de-prova CPs 21, 22, 23 e 24



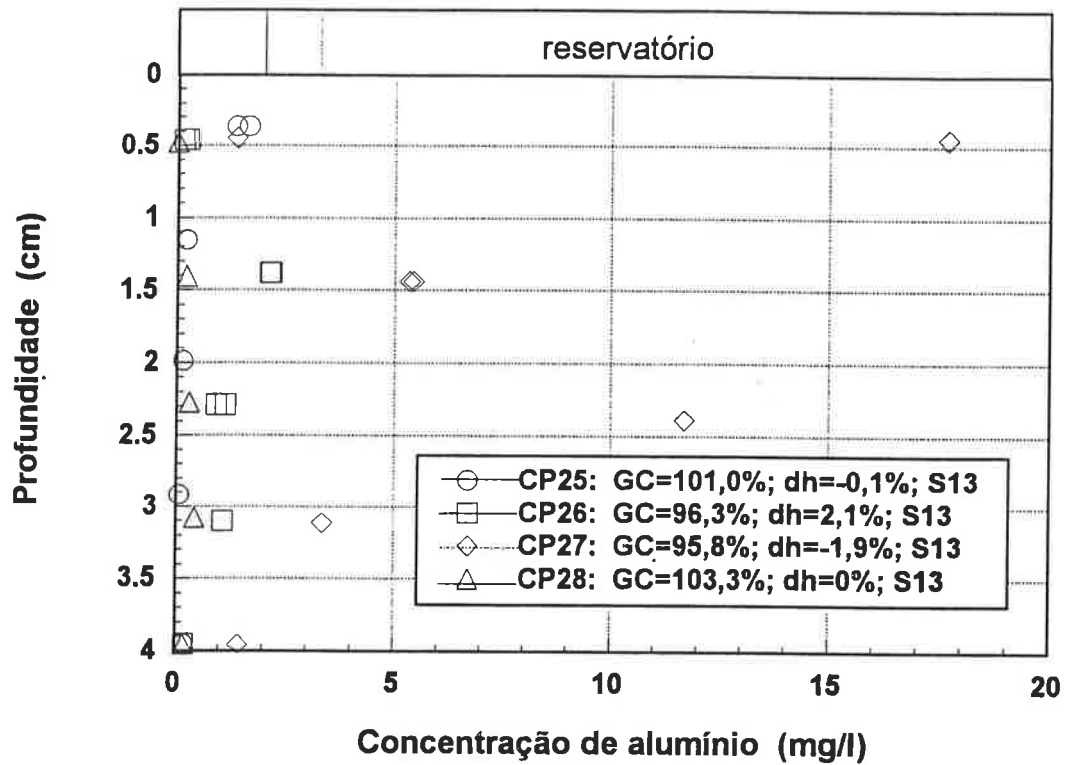
Concentração de mercúrio no corpo-de-prova CPs 21 e 22



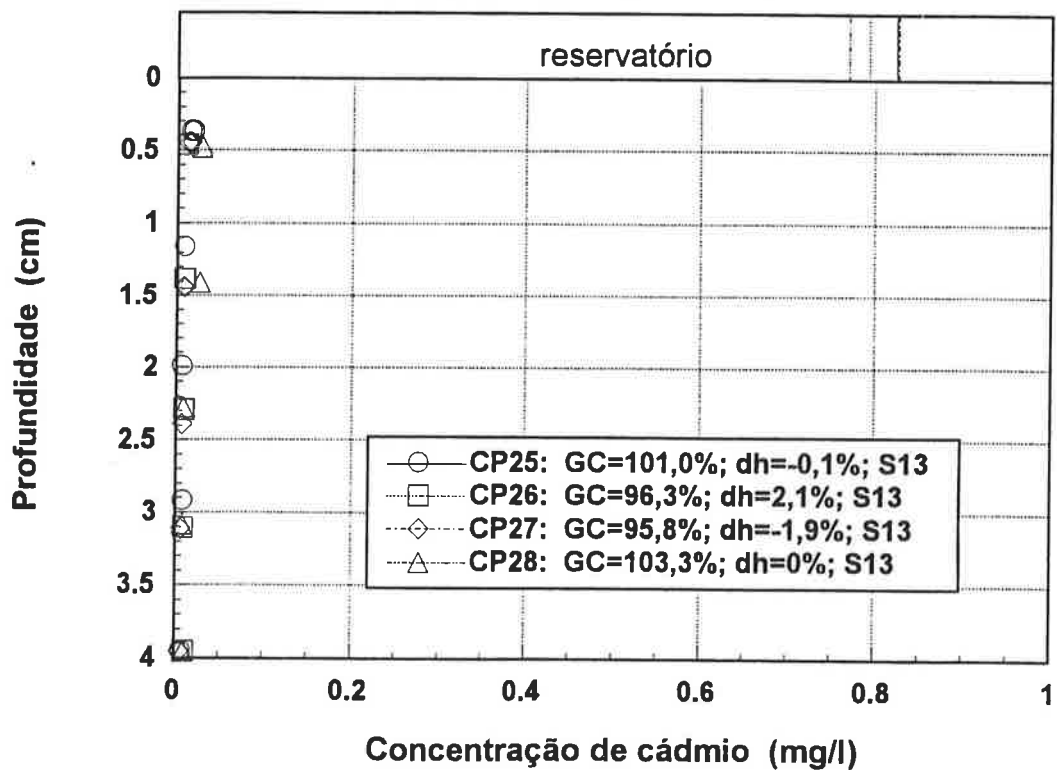
Concentração de zinco no corpo-de-prova CPs 21, 22, 23 e 24



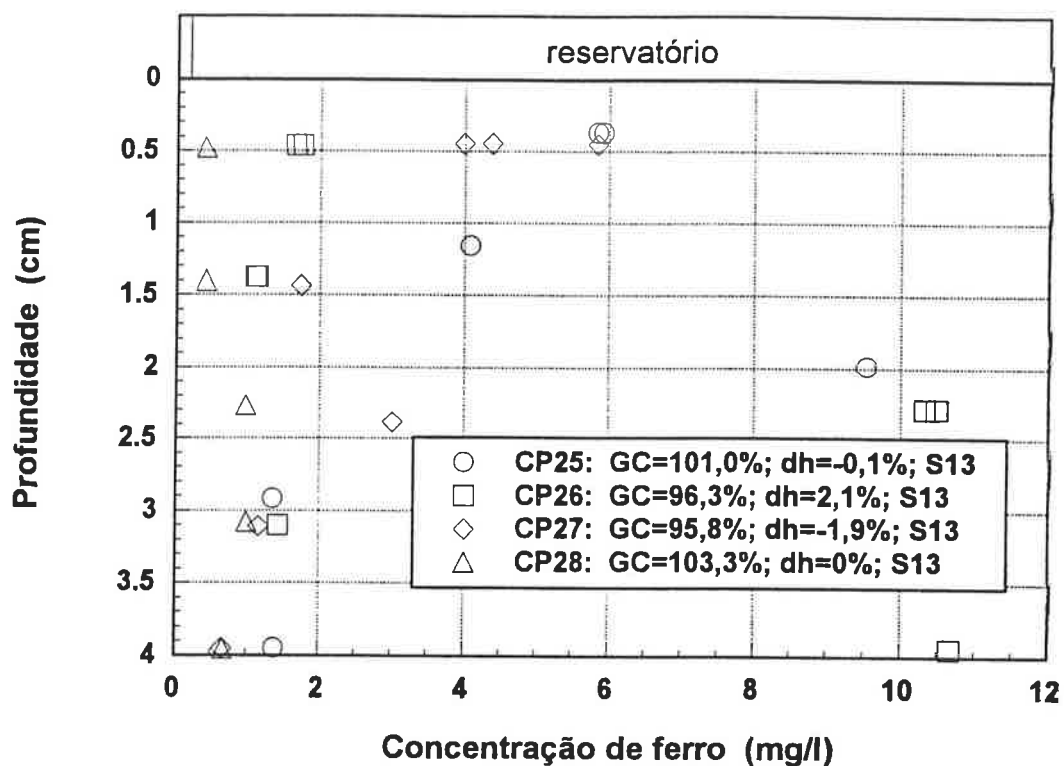
Concentração de alumínio no corpo-de-prova CPs 25, 26, 27 e 28



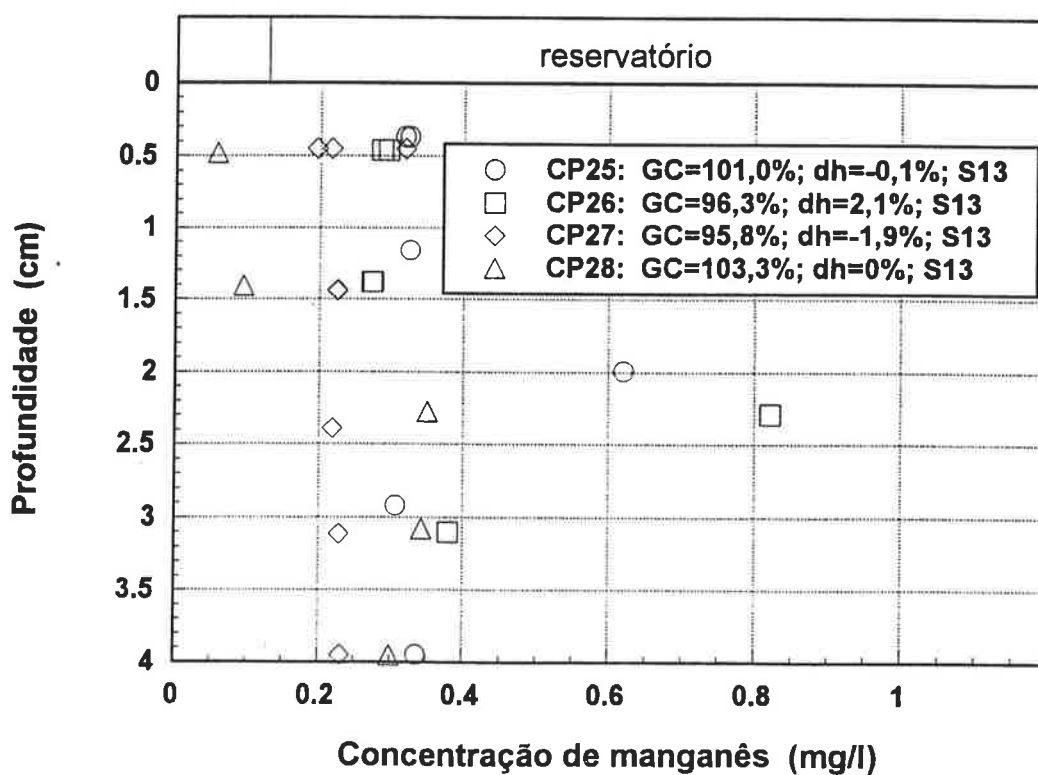
Concentração de cádmio no corpo-de-prova CPs 25, 26, 27 e 28



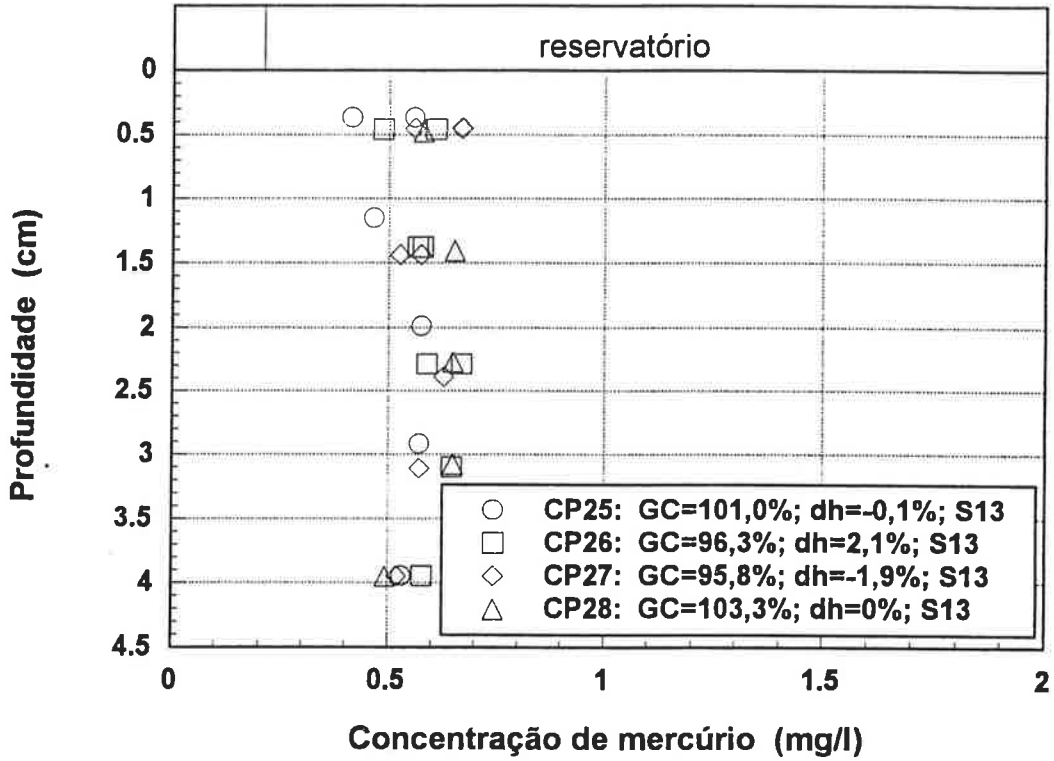
Concentração de ferro no corpo-de-prova CPs 25, 26, 27 e 28



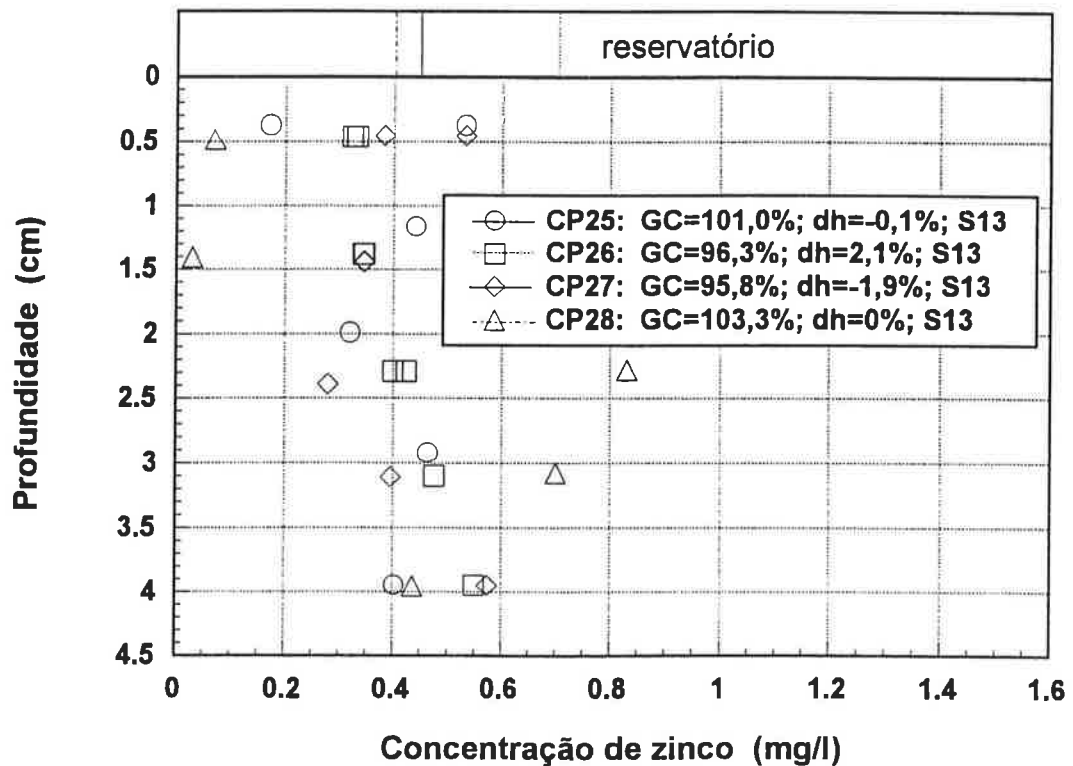
Concentração de manganês no corpo-de-prova CPs 25, 26, 27 e 28



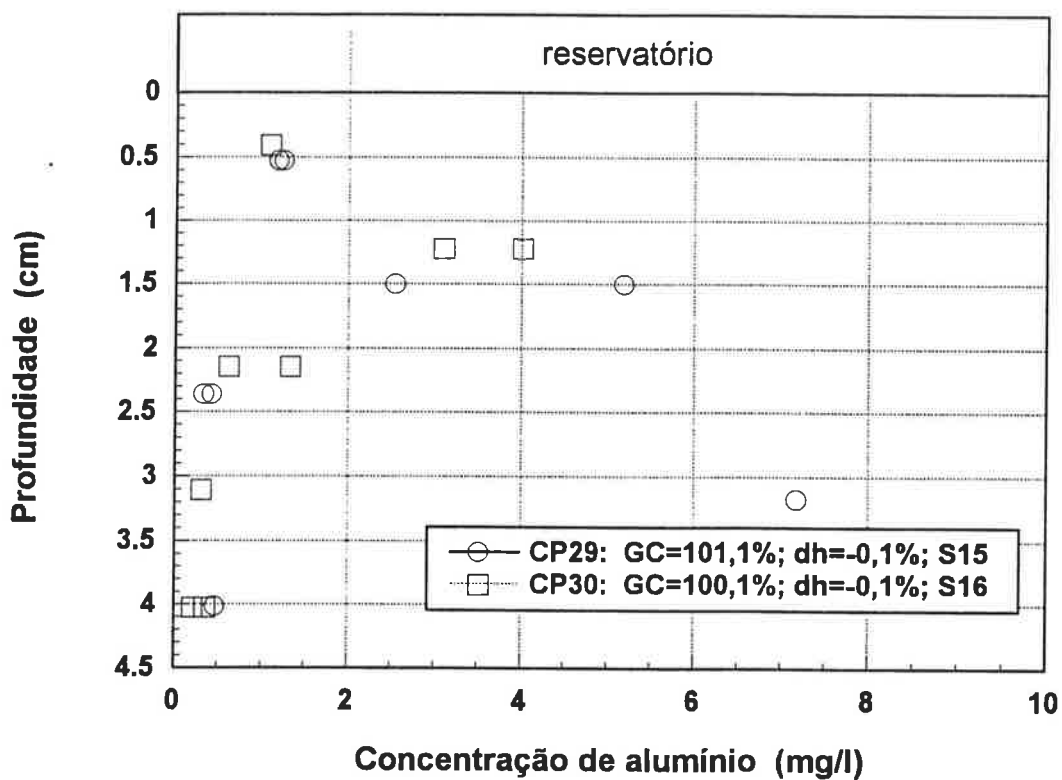
Concentração de mercúrio no corpo-de-prova CPs 25, 26, 27 e 28



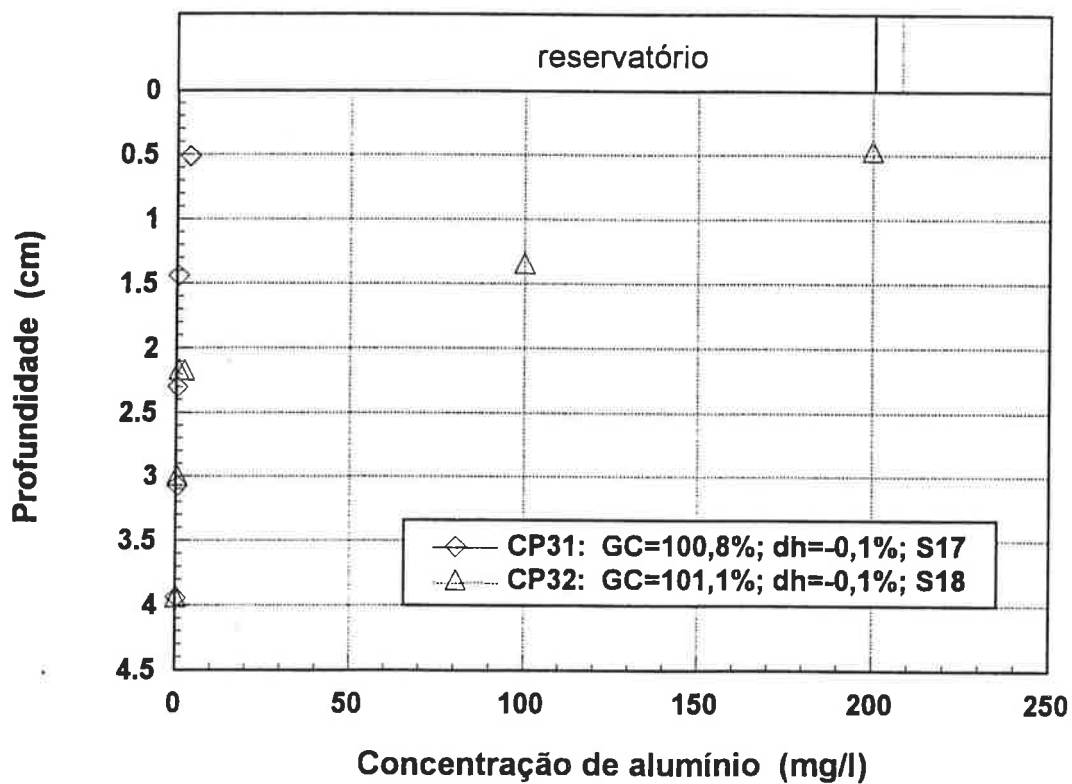
Concentração de zinco no corpo-de-prova CPs 25, 26, 27 e 28



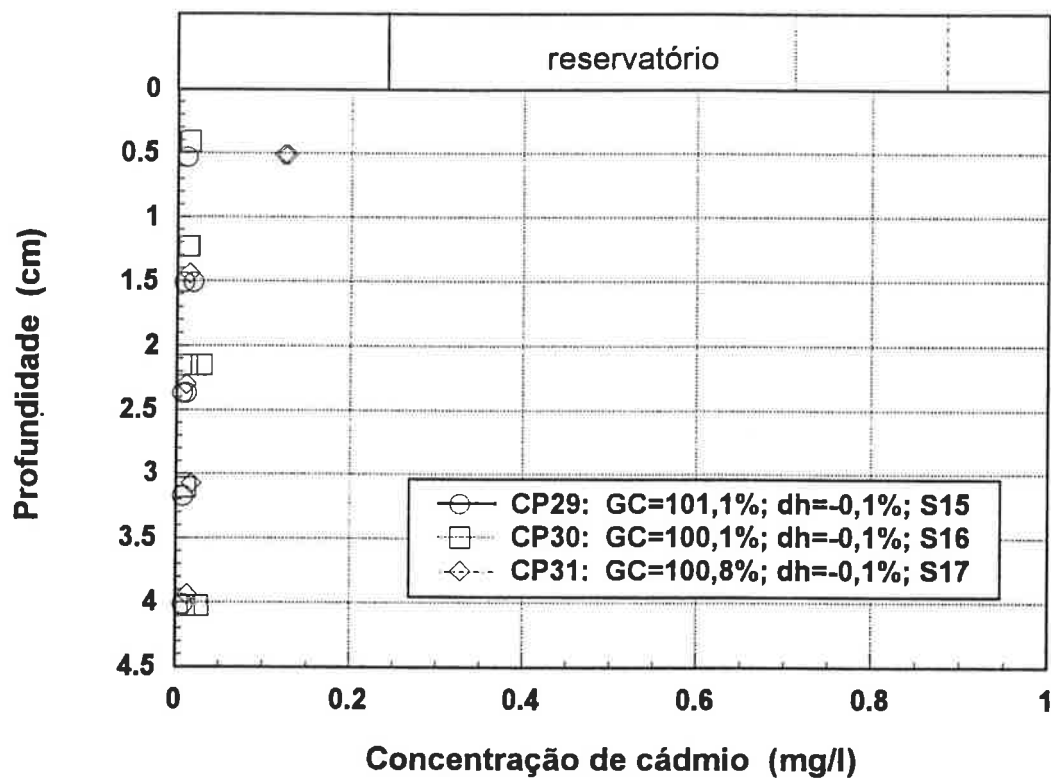
Concentração de alumínio no corpo-de-prova CPs 29 e 30



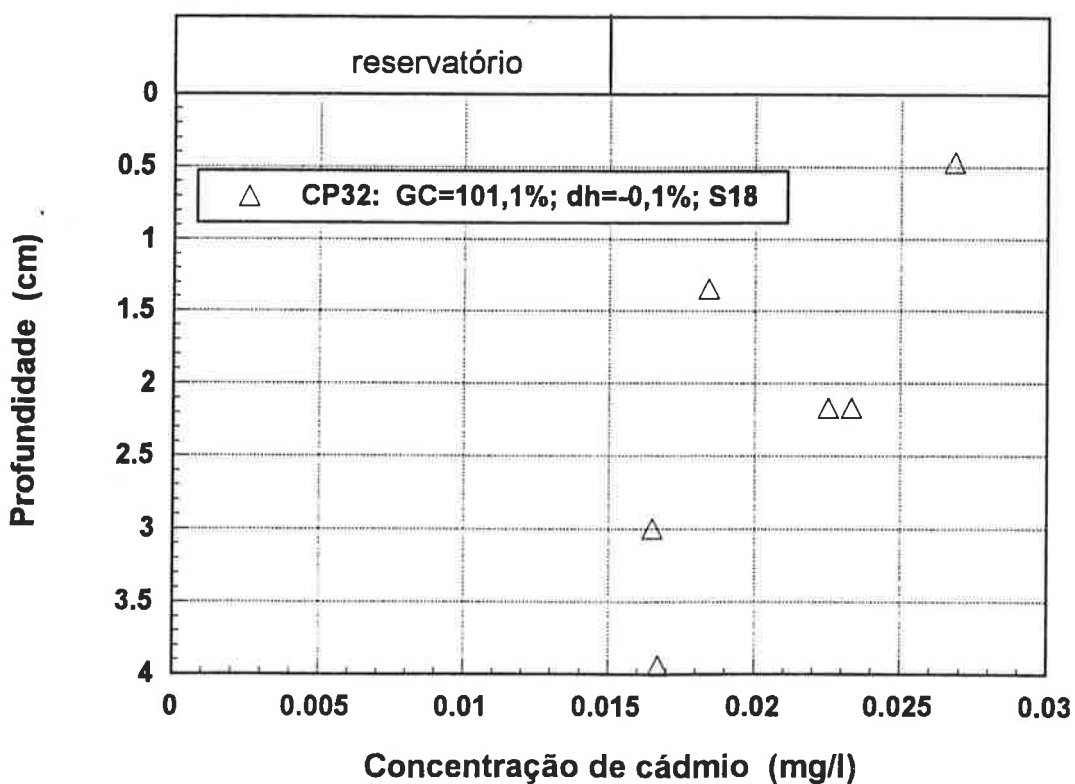
Concentração de alumínio no corpo-de-prova CPs 31 e 32



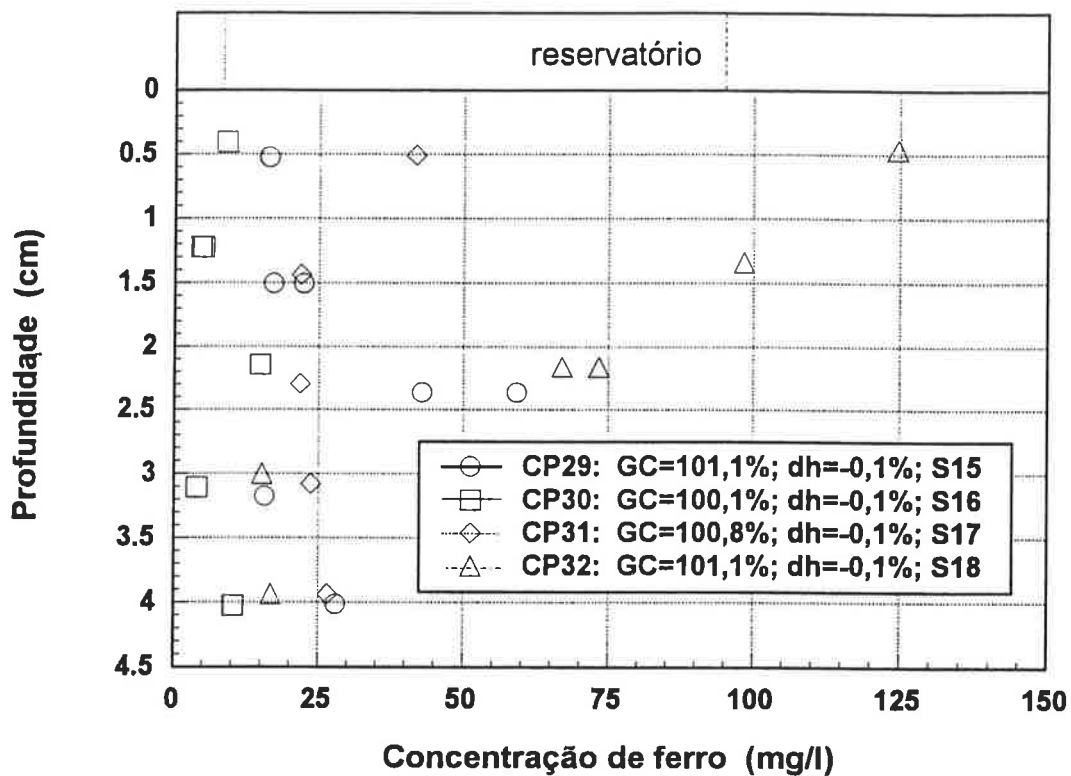
Concentração de cádmio no corpo-de-prova CPs 29, 30 e 31



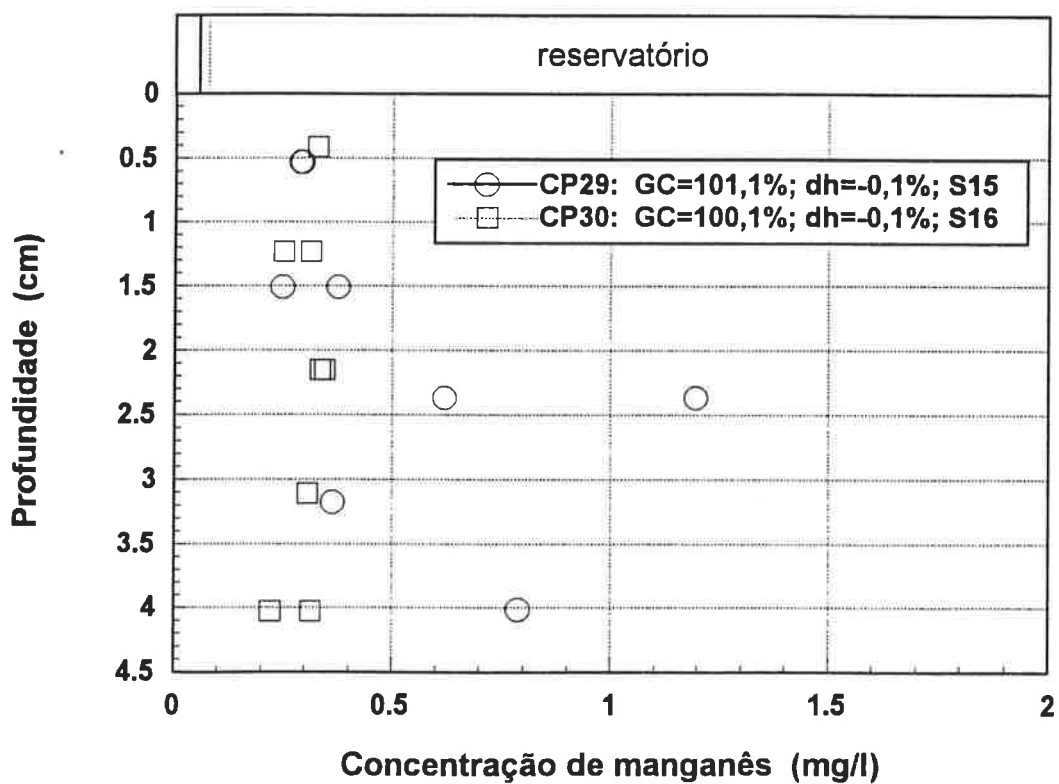
Concentração de cádmio no corpo-de-prova CP 32



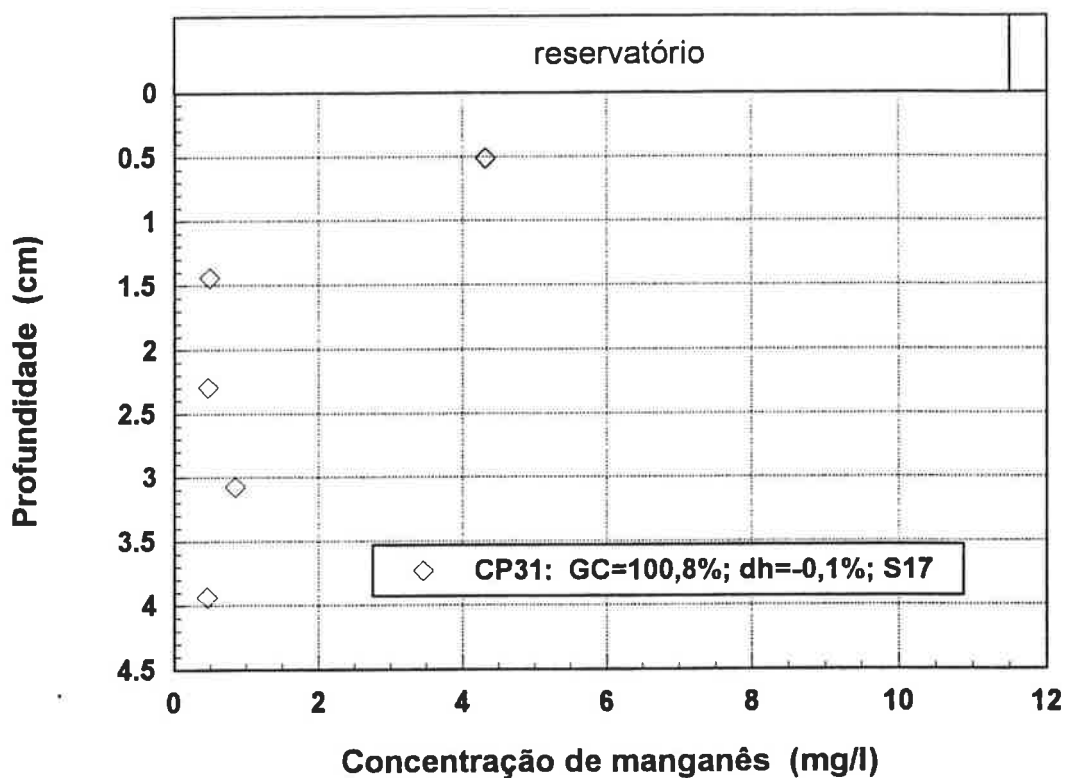
Concentração de ferro no corpo-de-prova CPs 29, 30, 31 e 32



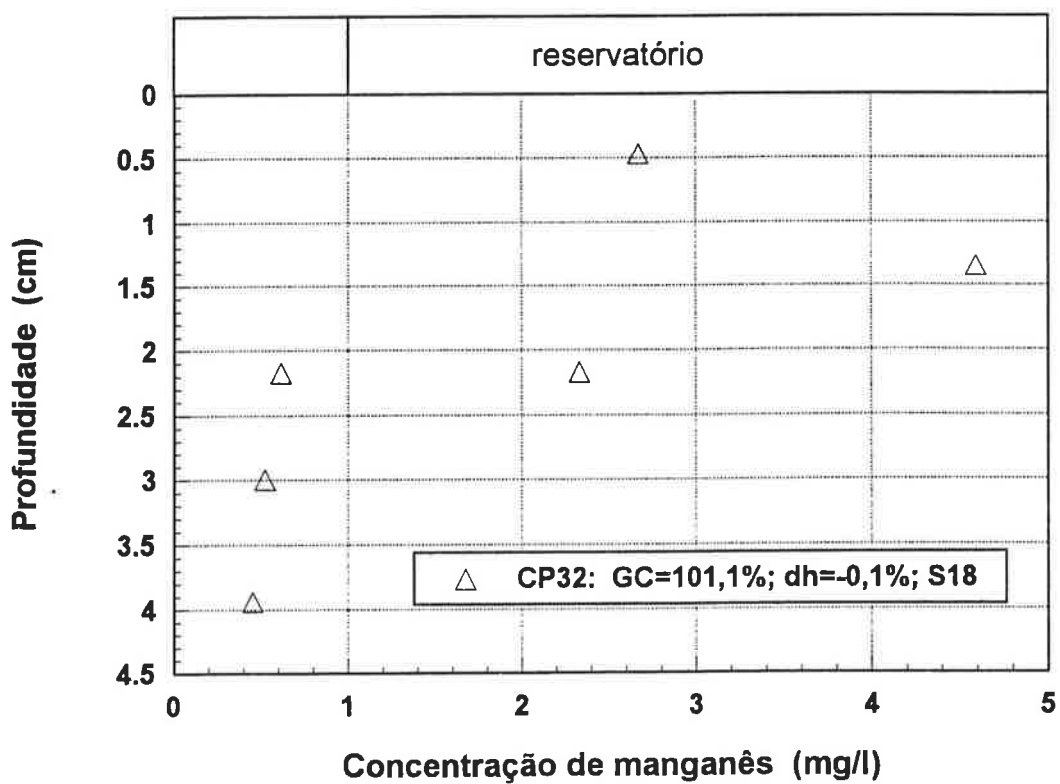
Concentração de manganês no corpo-de-prova CPs 29 e 30



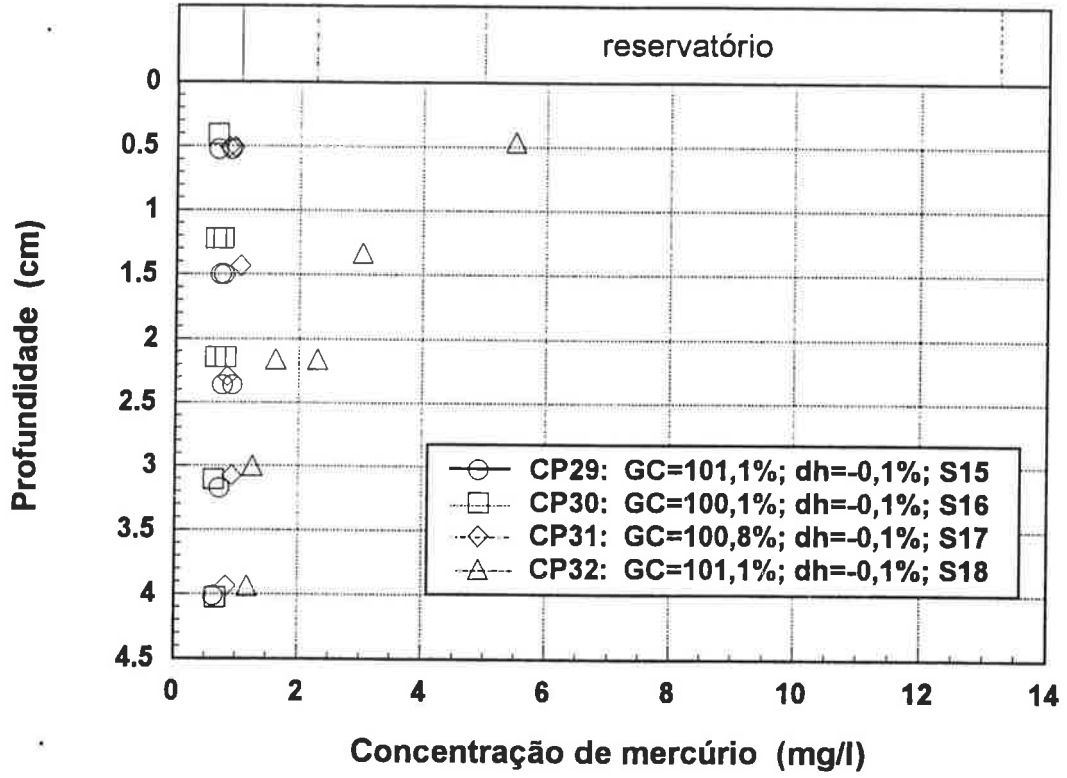
Concentração de manganês no corpo-de-prova CP 31



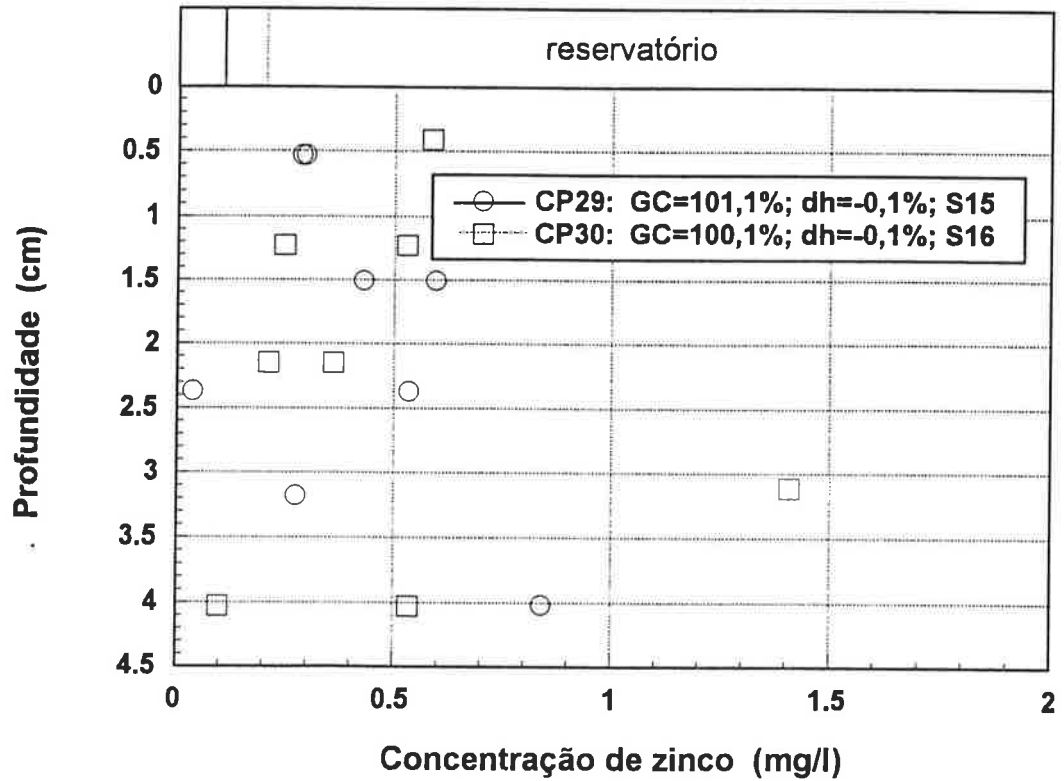
Concentração de manganês no corpo-de-prova CP 32



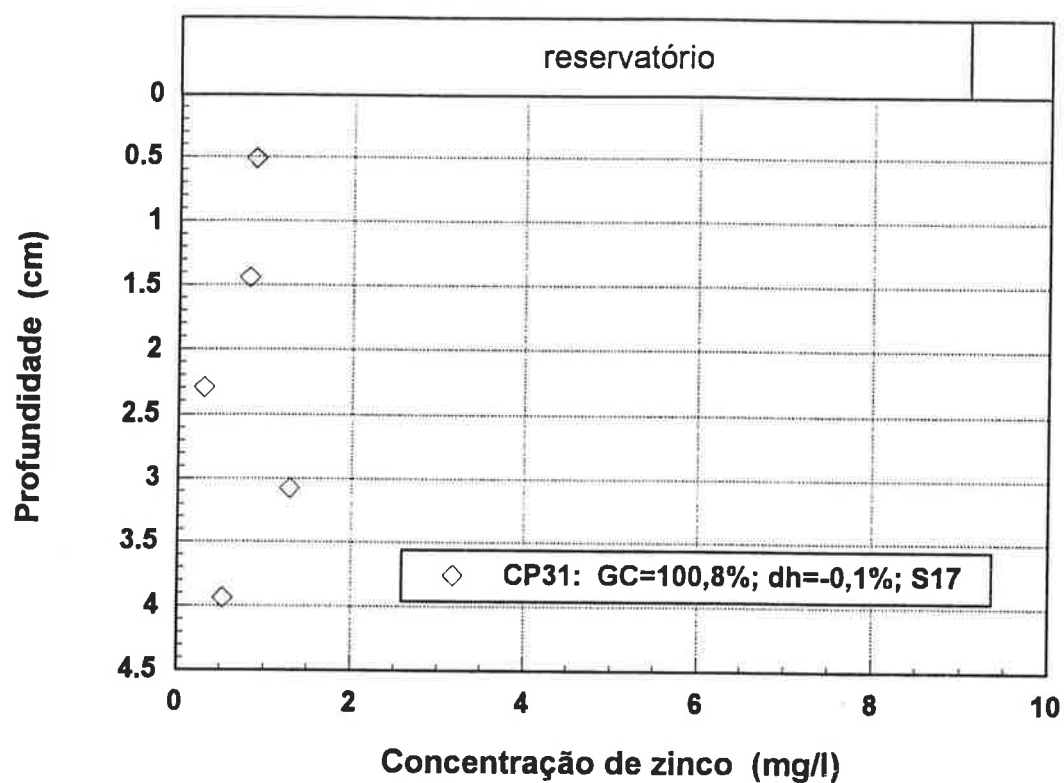
Concentração de mercúrio no corpo-de-prova CPs 29, 30, 31 e 32



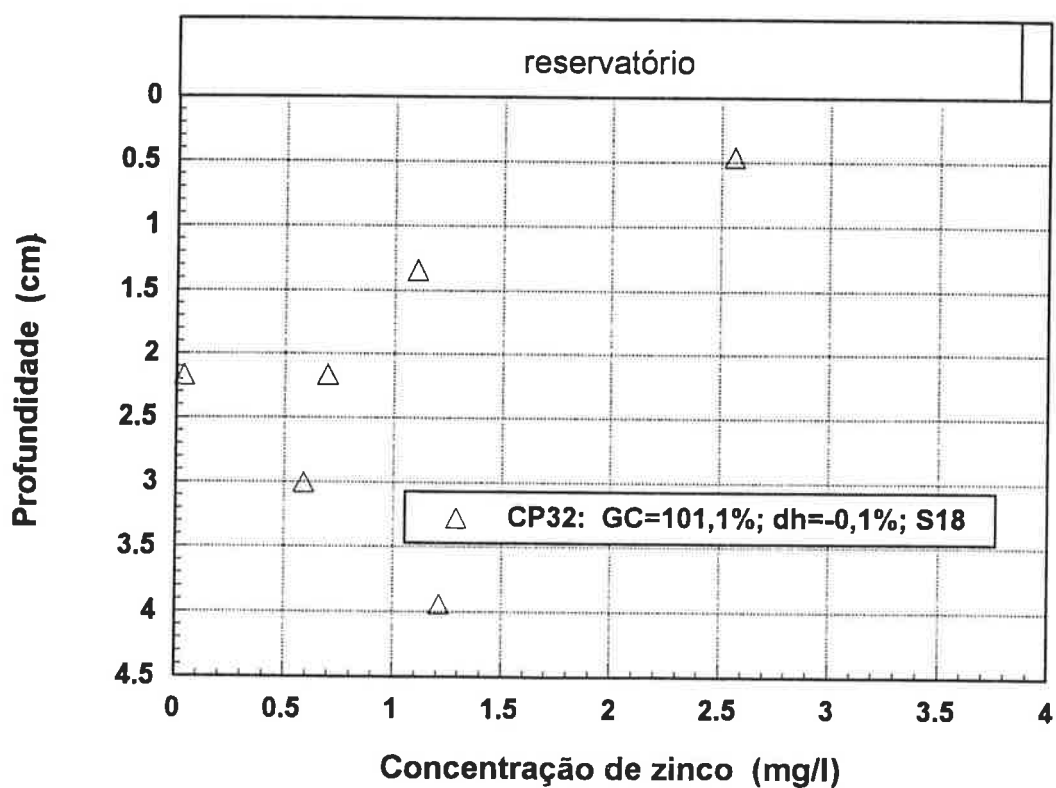
Concentração de zinco no corpo-de-prova CPs 29 e 30



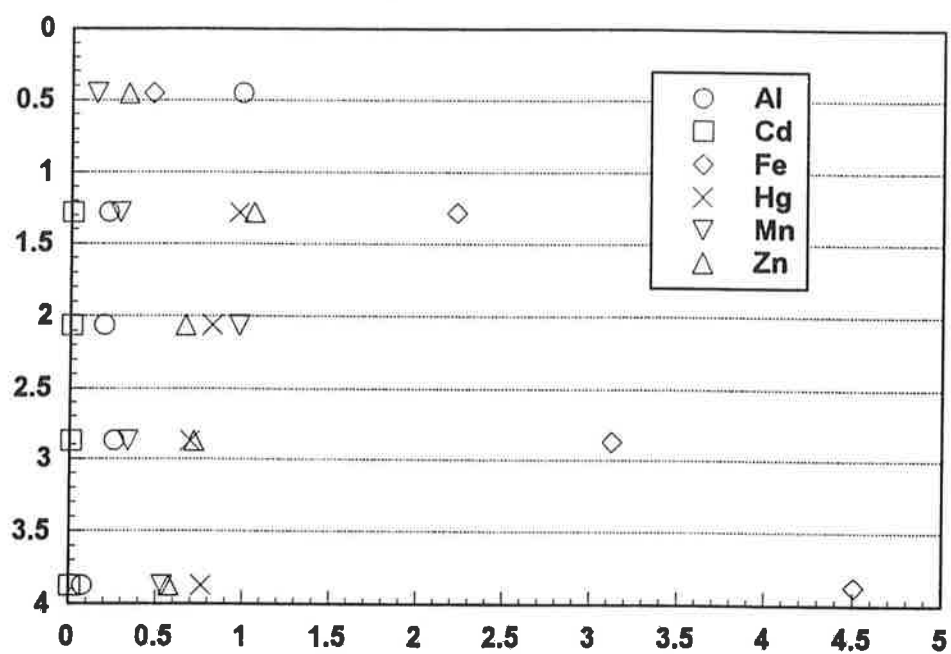
Concentração de zinco no corpo-de-prova CP 31



Concentração de zinco no corpo-de-prova CP 32



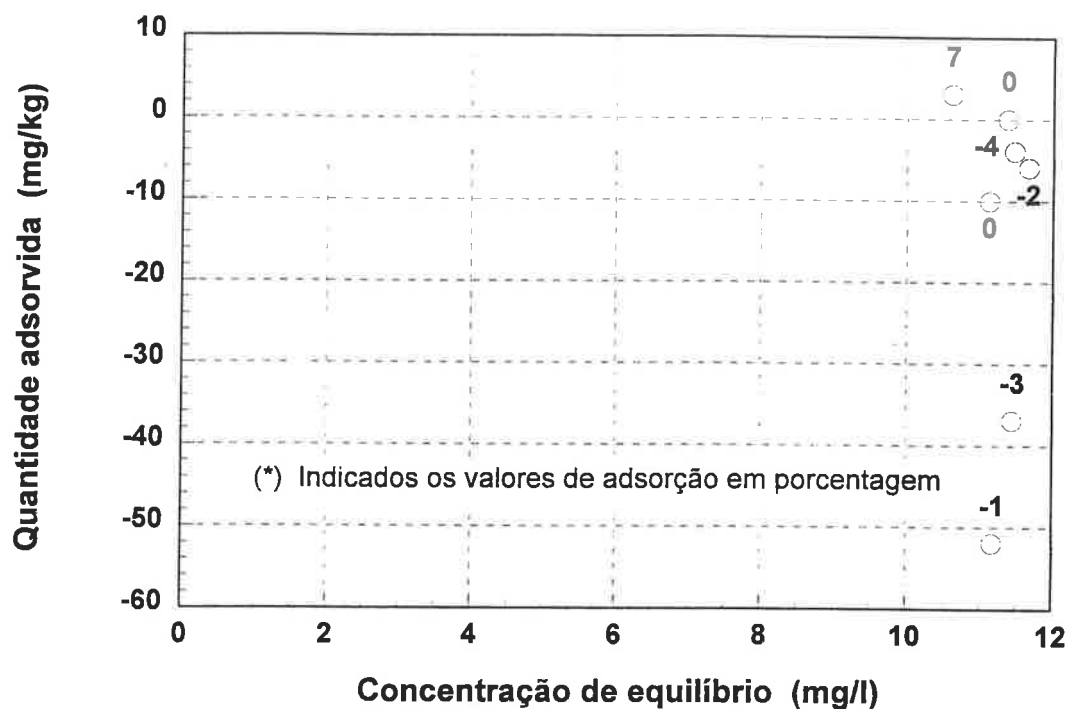
Concentração dos metais no corpo-de-prova CP "BRANCO"



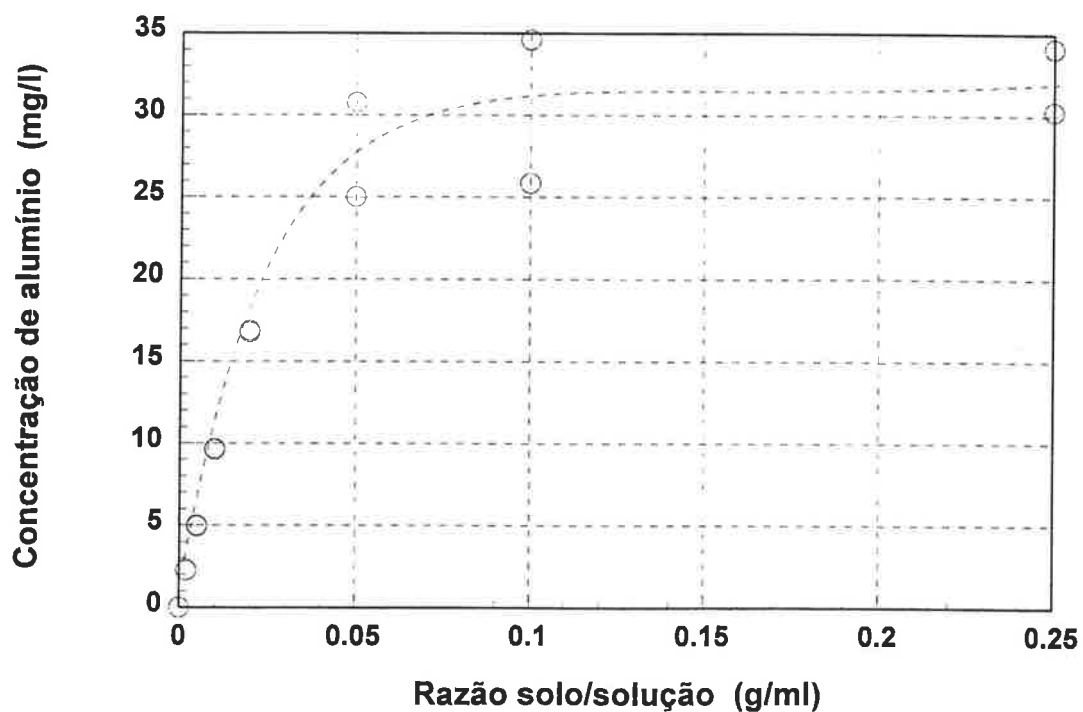
ANEXO K

RESULTADOS DOS ENSAIOS DE ADSORÇÃO

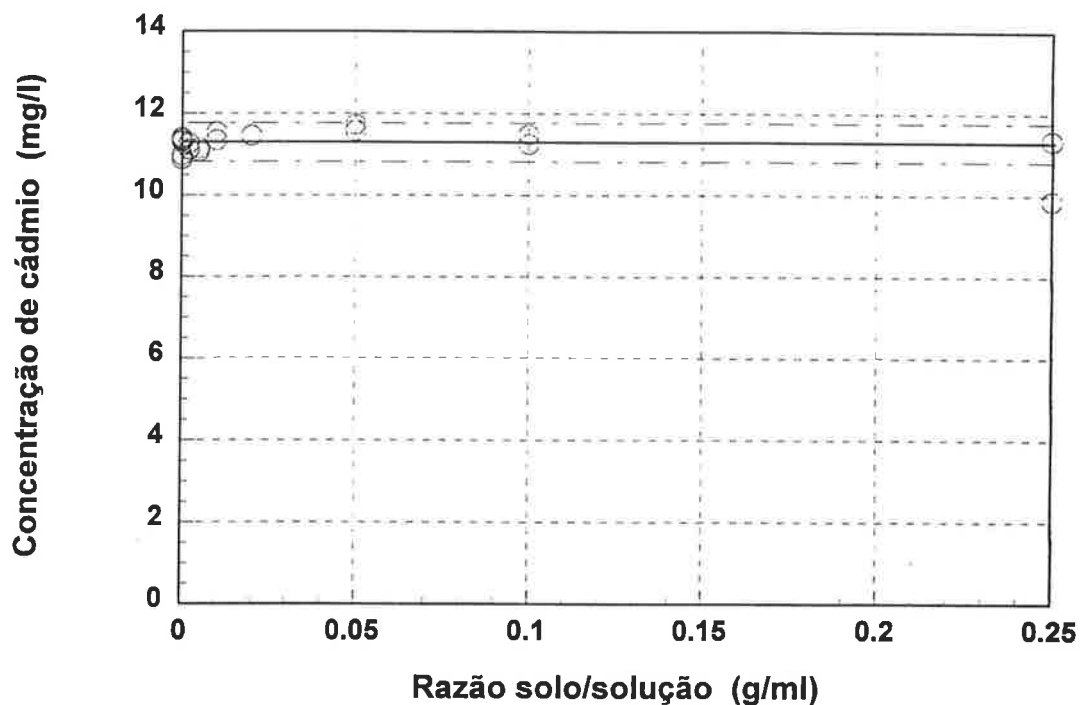
Isoterma linear de adsorção de cádmio
Argila vermelha
Ensaio 1



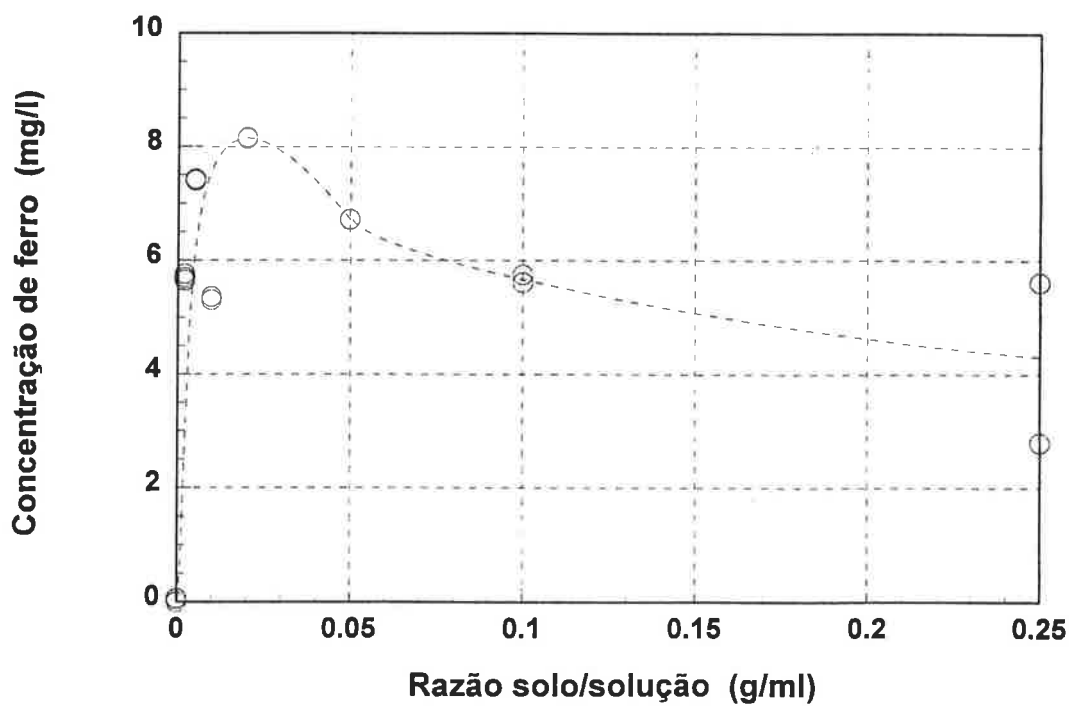
Ensaio de adsorção de cádmio na argila vermelha
Concentração de alumínio na solução
em função da razão solo/solução



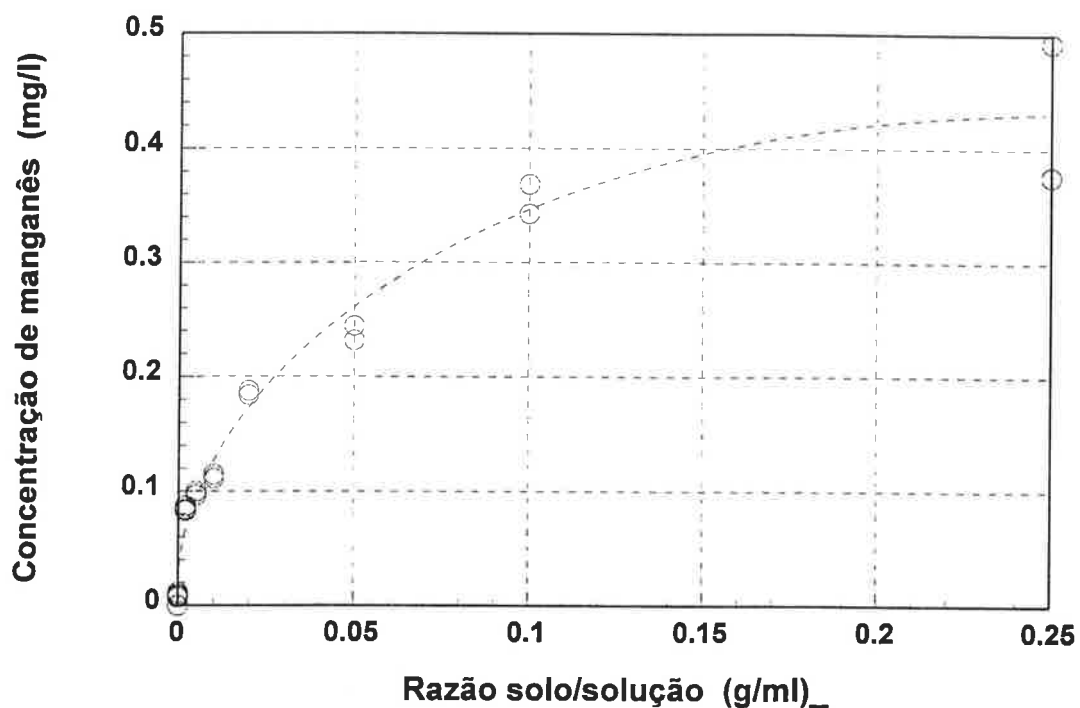
Ensaio de adsorção de cádmio na argila vermelha
Concentração de cádmio na solução
em função da razão solo/solução



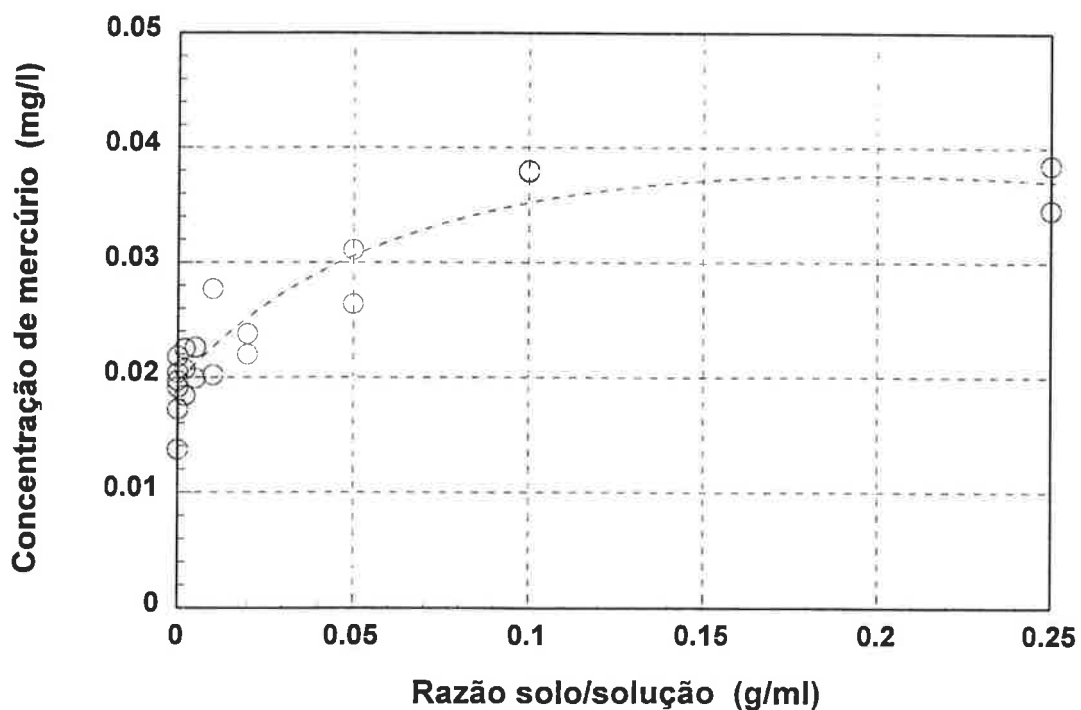
Ensaio de adsorção de cádmio na argila vermelha
Concentração de ferro na solução
em função da razão solo/solução



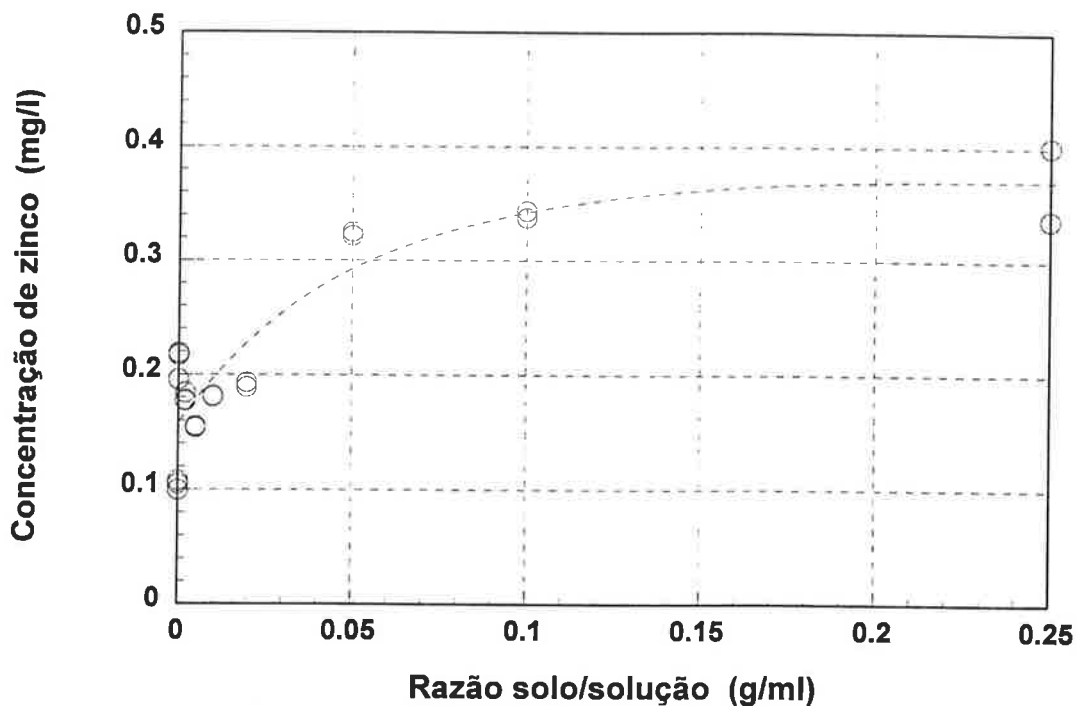
Ensaio de adsorção de cádmio na argila vermelha
Concentração de manganês na solução
em função da razão solo/solução



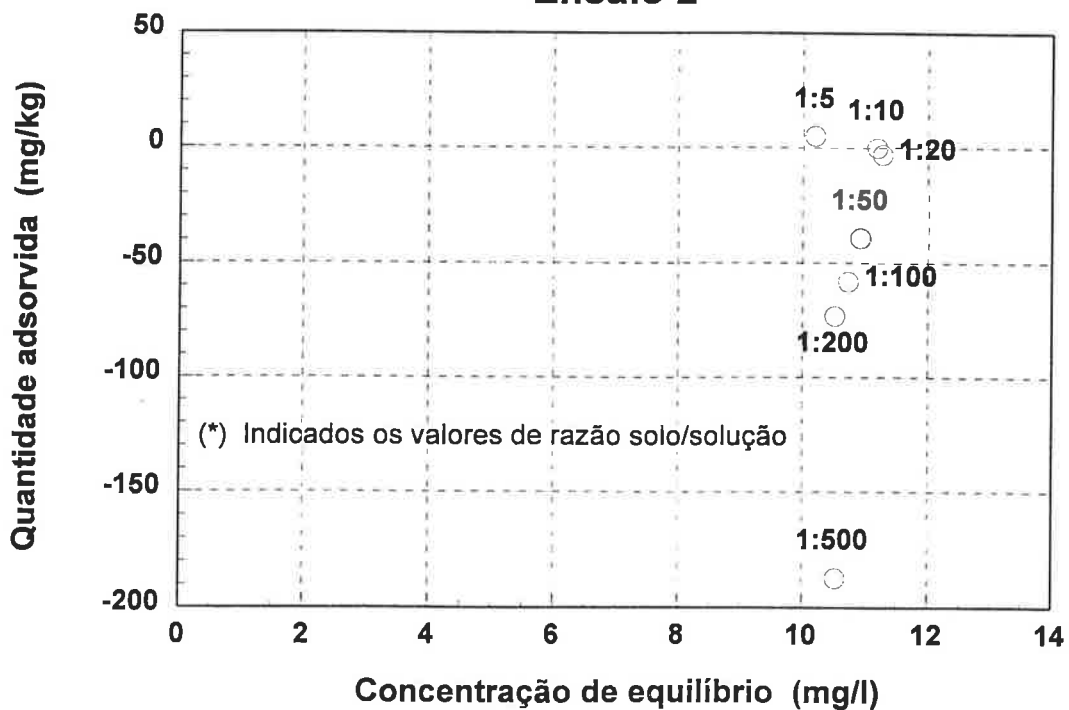
Ensaio de adsorção de cádmio na argila vermelha
Concentração de mercúrio na solução
em função da razão solo/solução



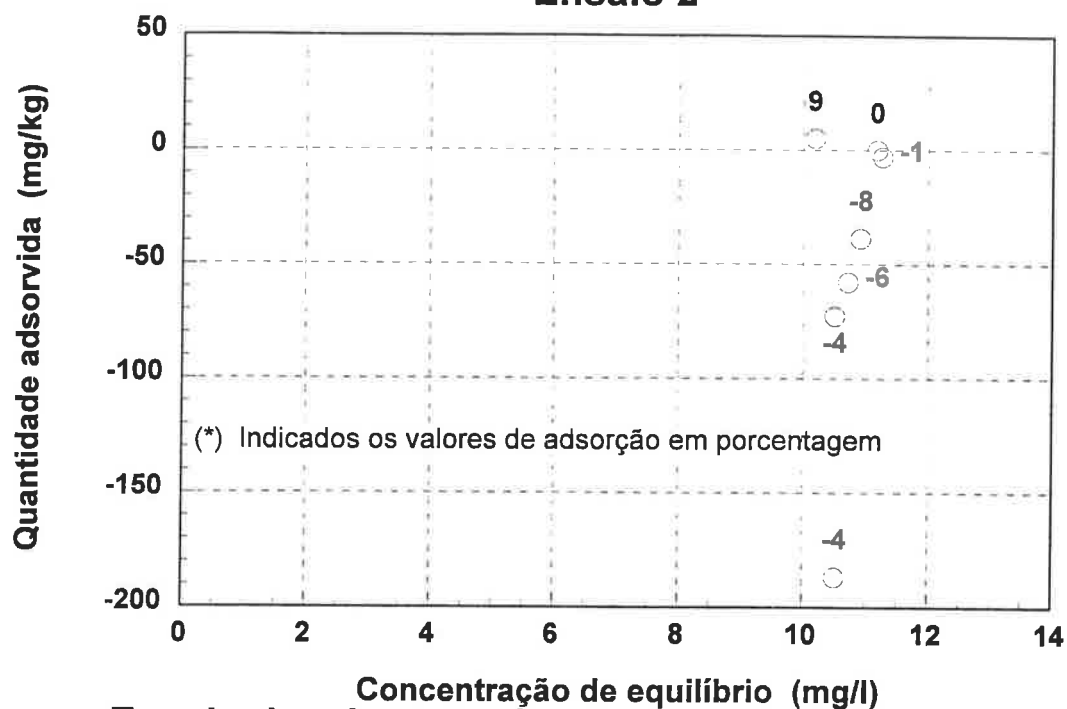
Ensaio de adsorção de cádmio na argila vermelha
Concentração de zinco na solução
em função da razão solo/solução



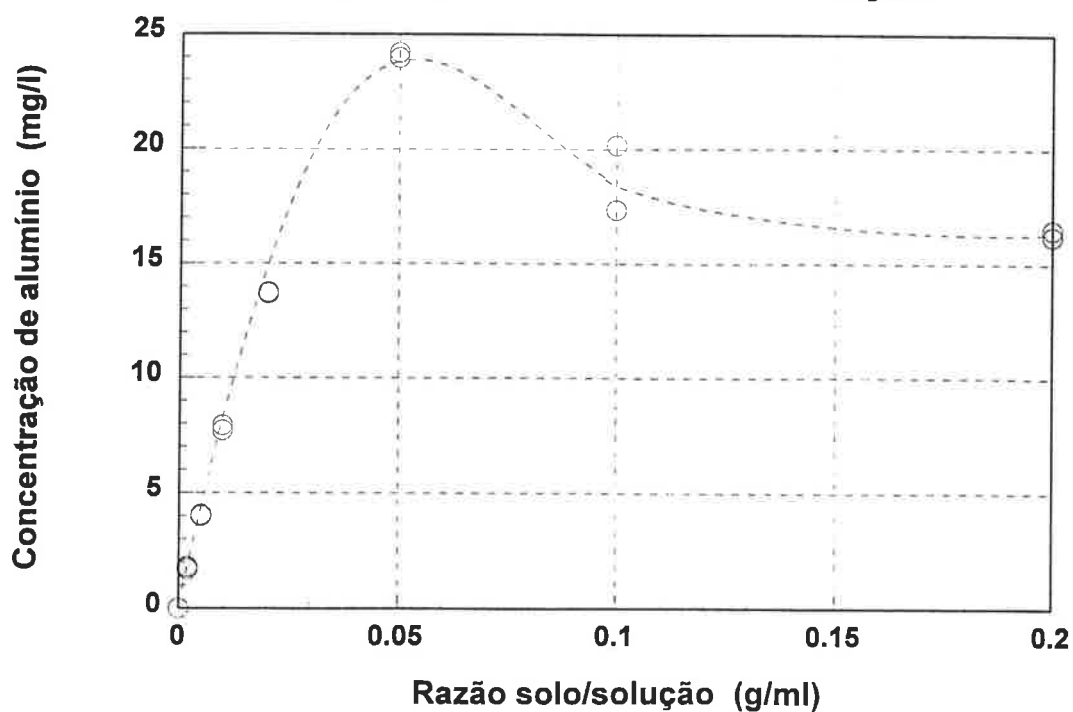
Isoterma linear de adsorção de cádmio
Argila vermelha
Ensaio 2



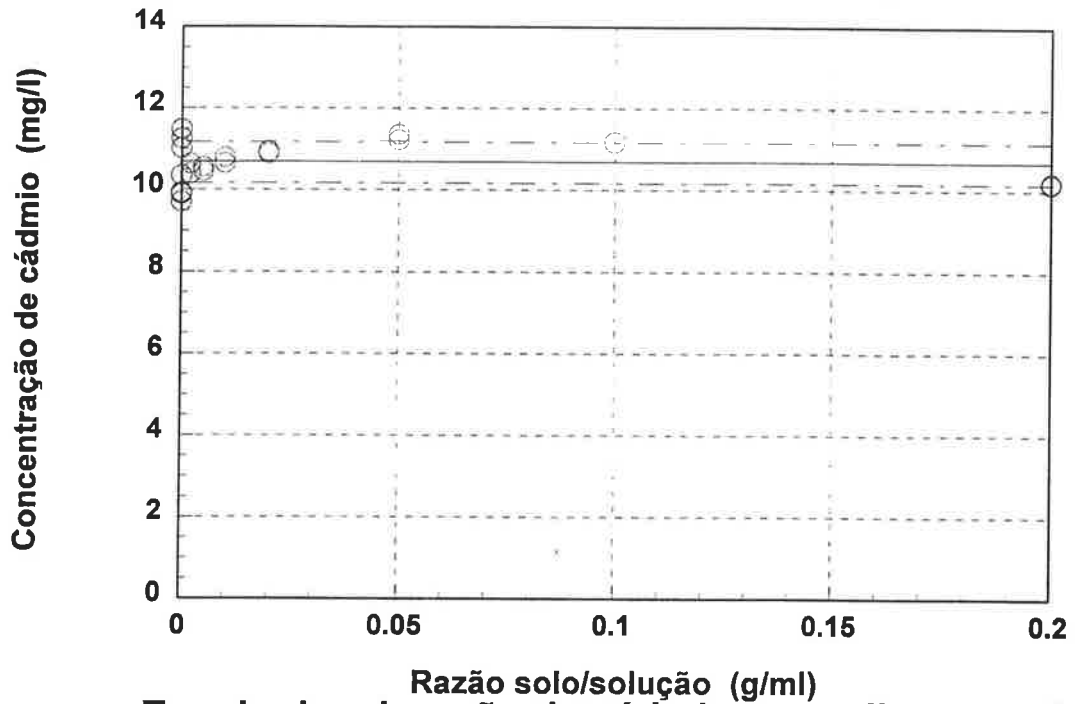
**Isoterma linear de adsorção de cádmio
Argila vermelha
Ensaio 2**



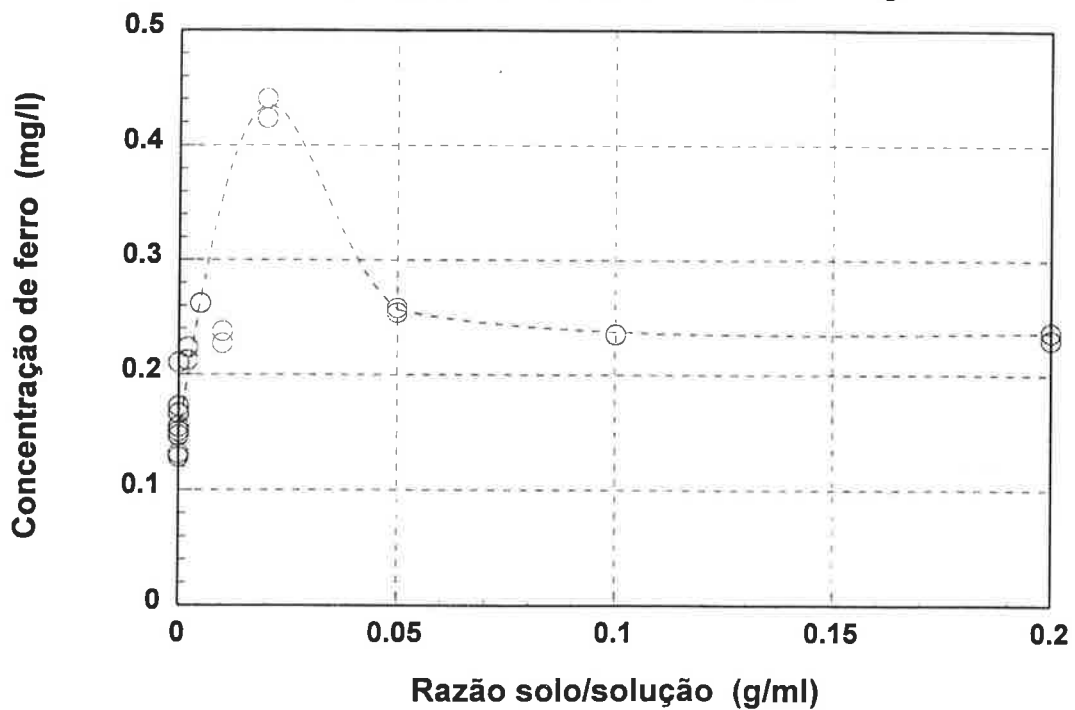
**Ensaio de adsorção de cádmio na argila vermelha
Concentração de alumínio na solução
em função da razão solo/solução**



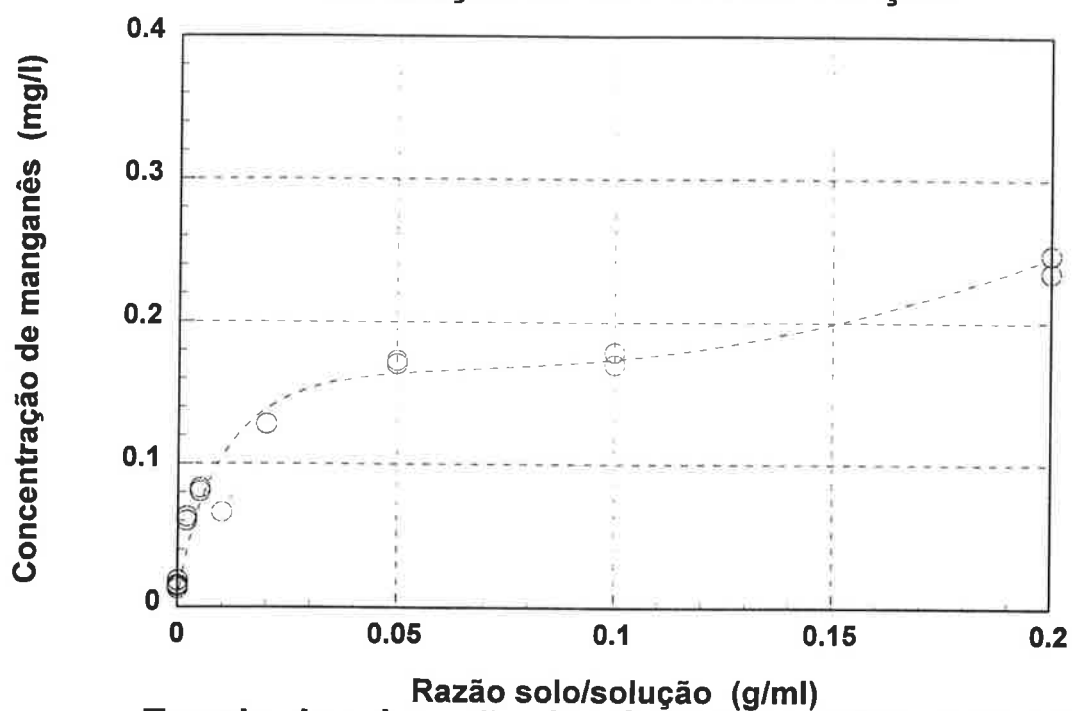
Ensaio de adsorção de cádmio na argila vermelha
Concentração de cádmio na solução
em função da razão solo/solução



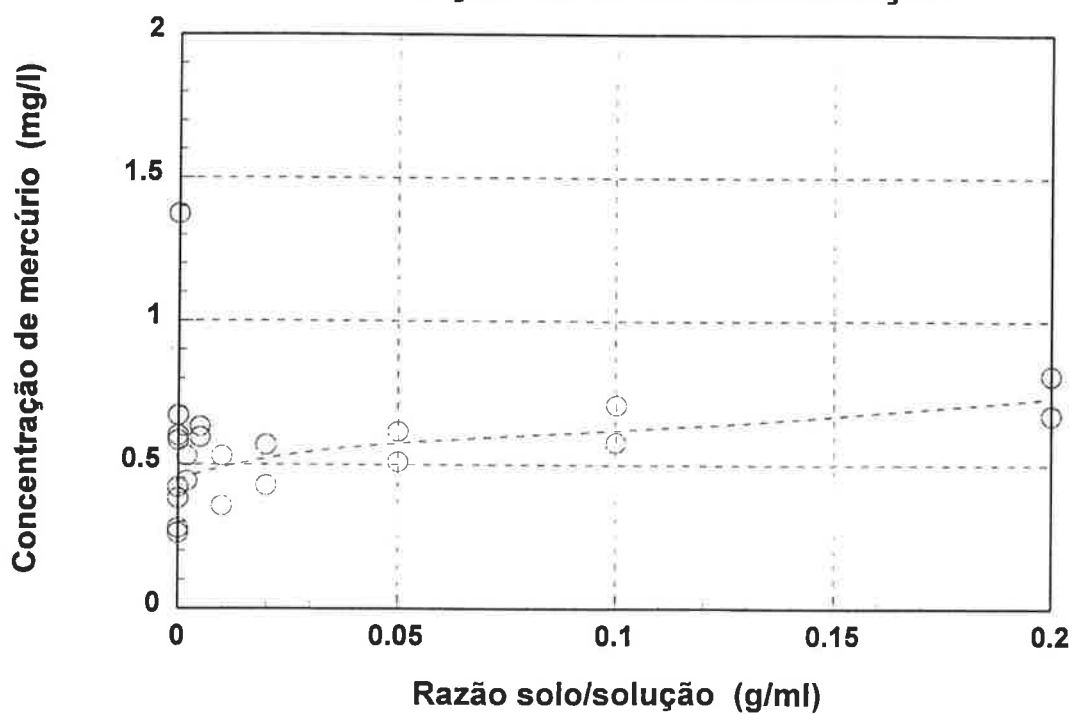
Ensaio de adsorção de cádmio na argila vermelha
Concentração de ferro na solução
em função da razão solo/solução



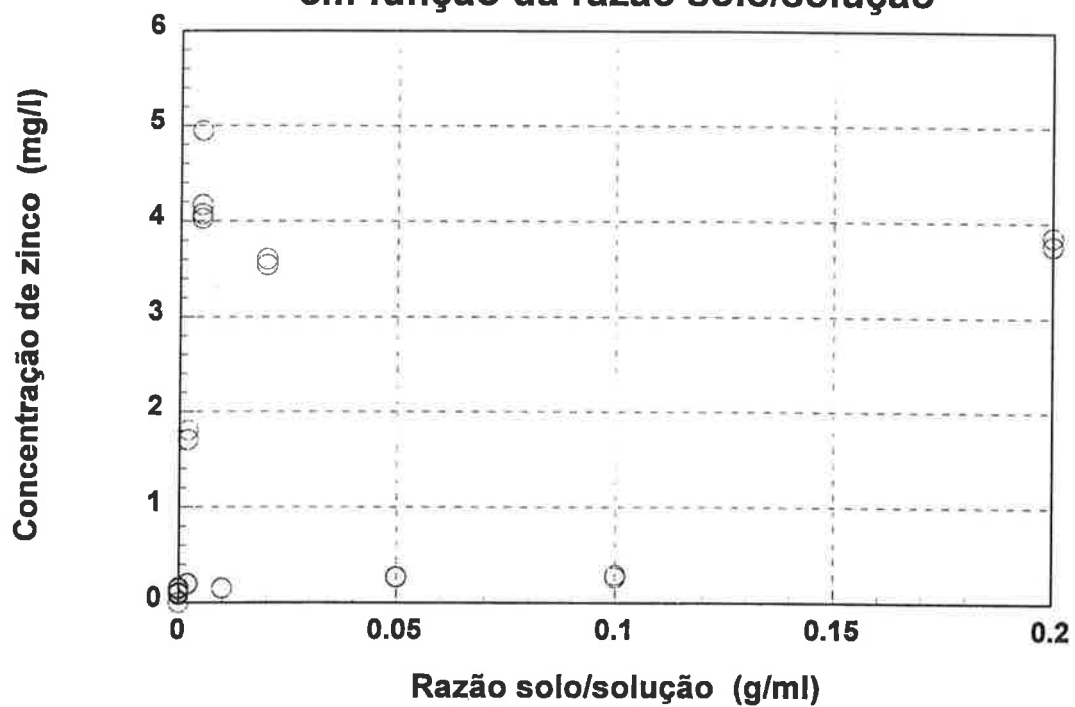
Ensaio de adsorção de cádmio na argila vermelha
Concentração de manganês na solução
em função da razão solo/solução



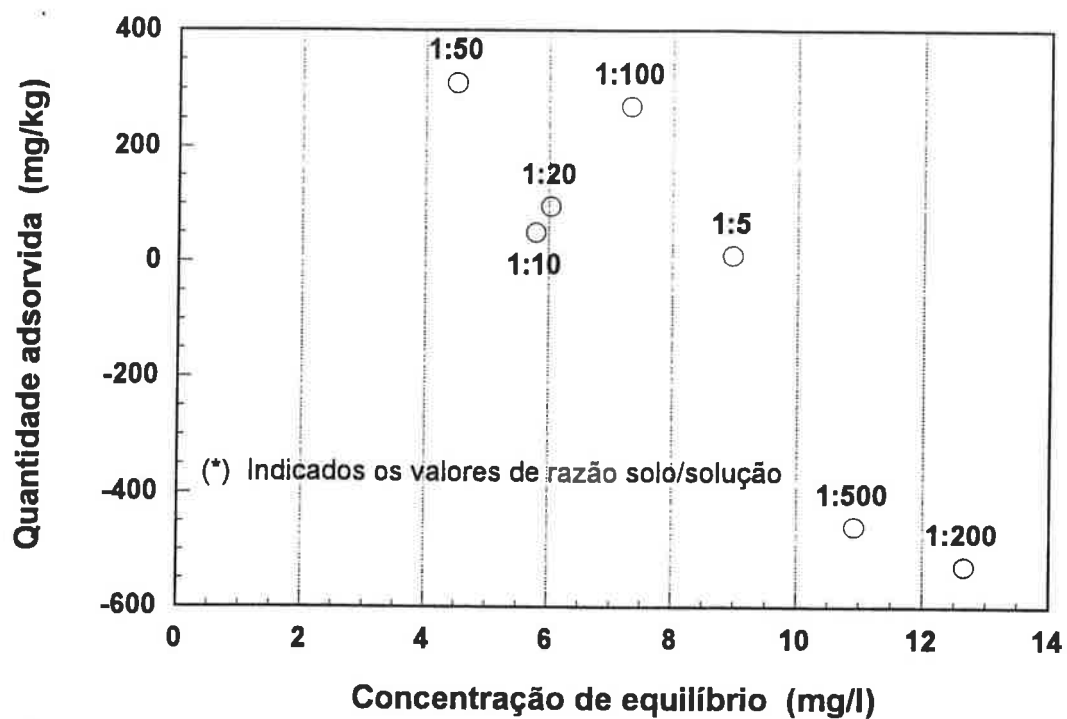
Ensaio de adsorção de cádmio na argila vermelha
Concentração de mercúrio na solução
em função da razão solo/solução



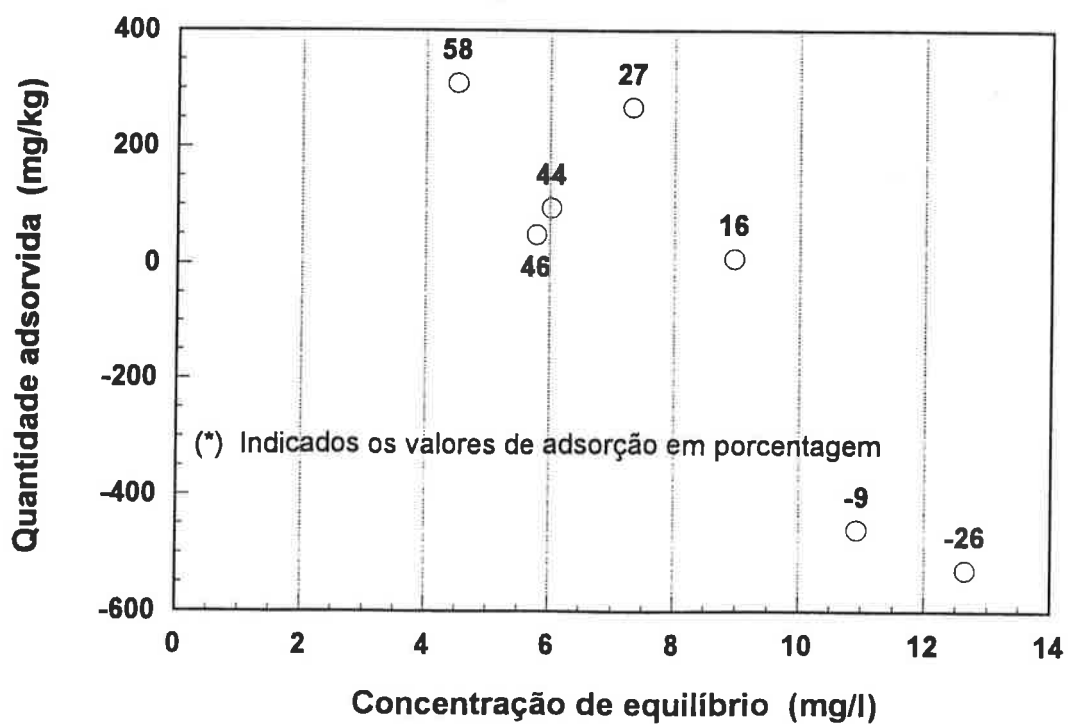
Ensaio de adsorção de cádmio na argila vermelha
Concentração de zinco na solução
em função da razão solo/solução



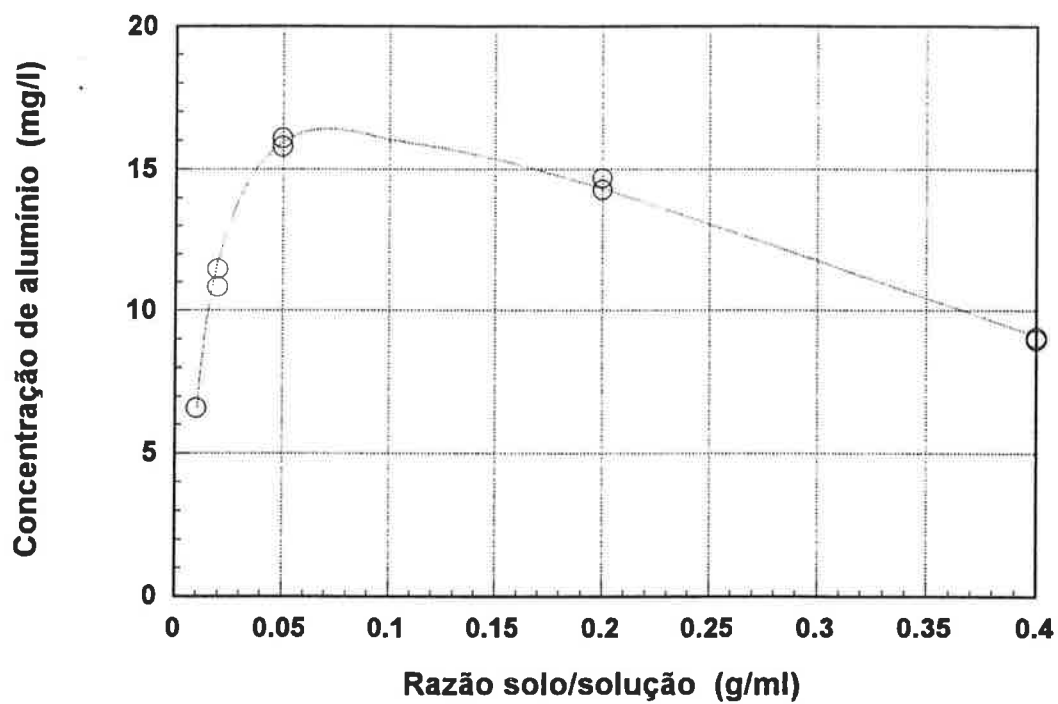
Isoterma de adsorção de mercúrio Argila vermelha



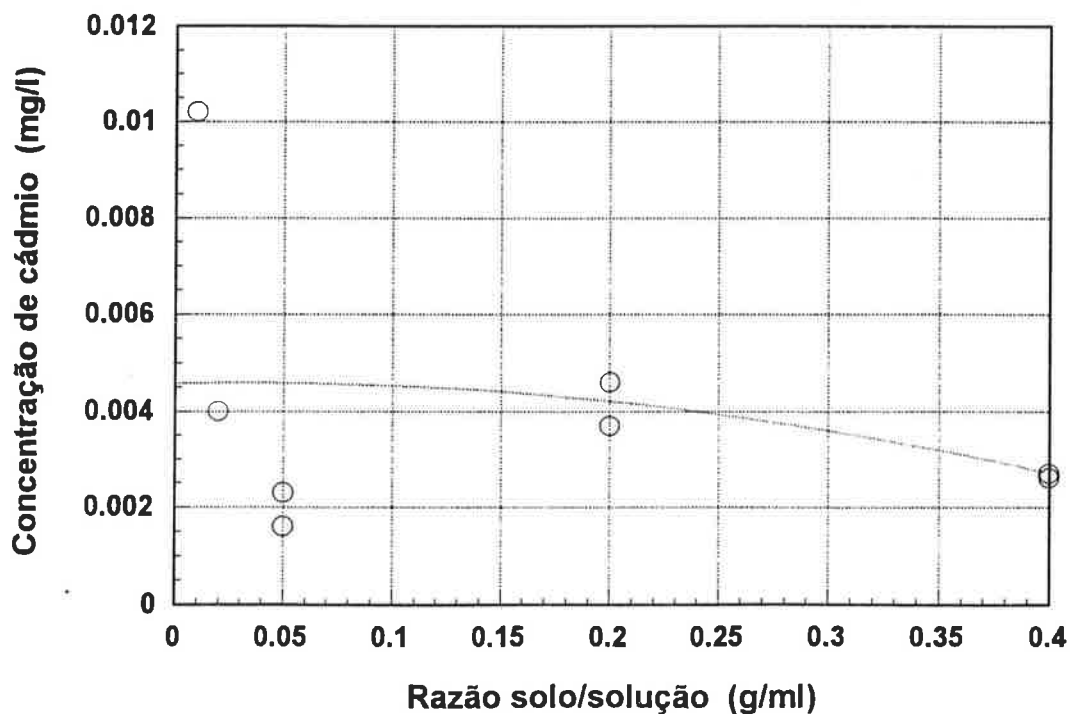
Isoterma de adsorção de mercúrio Argila vermelha



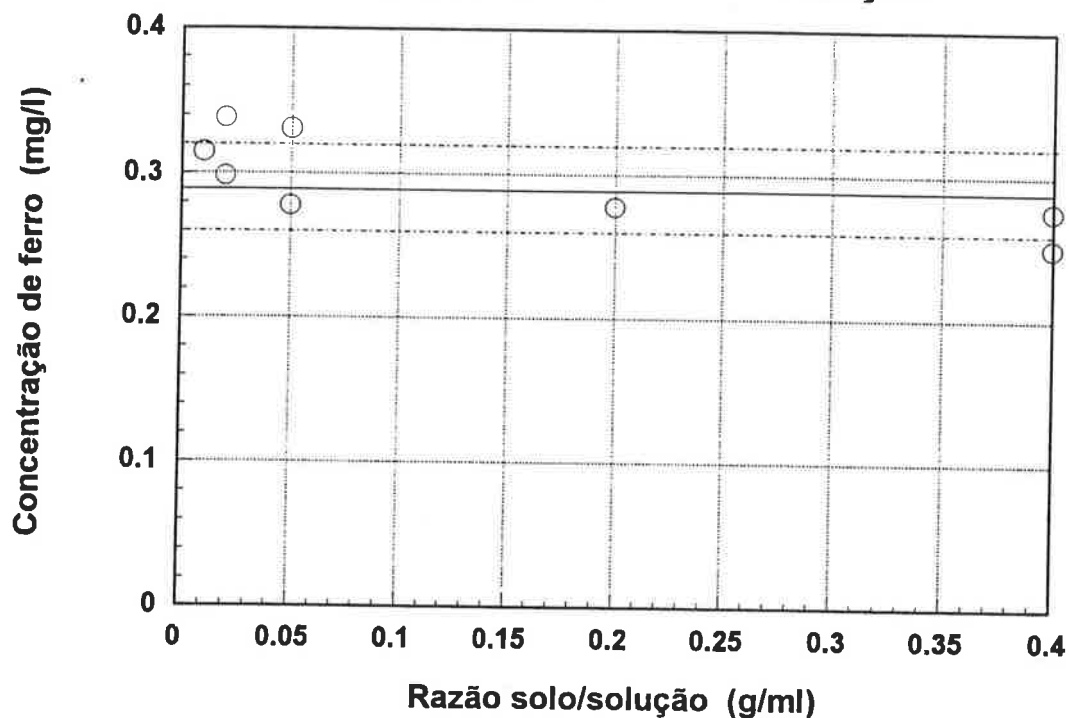
Ensaio de adsorção de mercúrio na argila vermelha
Concentração de alumínio na solução
em função da razão solo/solução



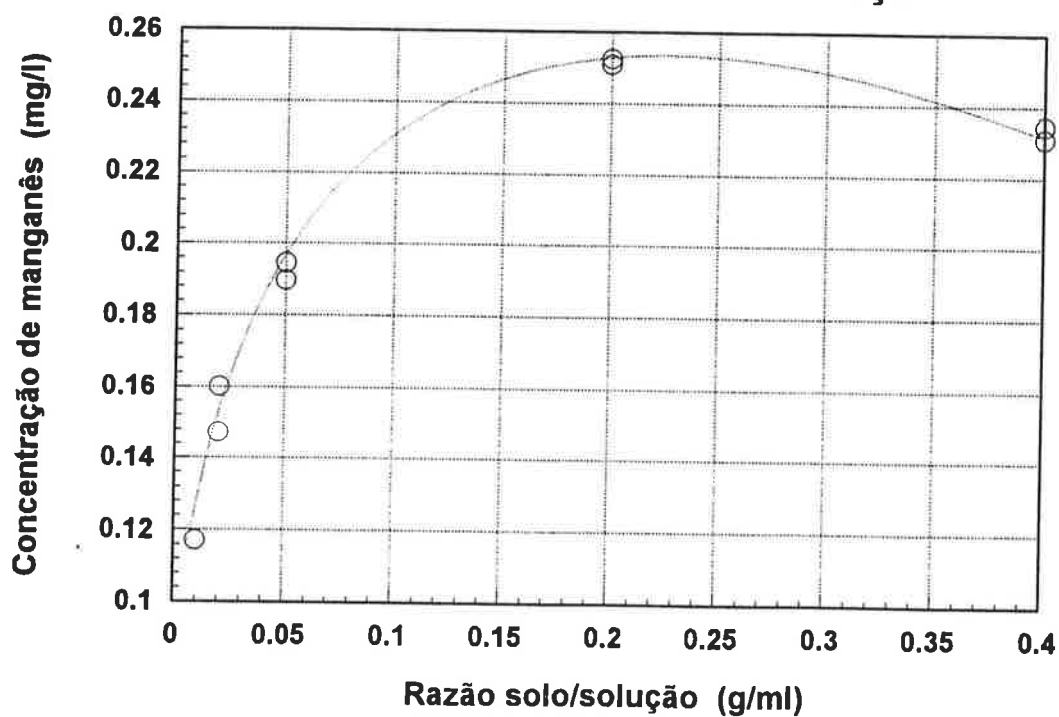
Ensaio de adsorção de mercúrio na argila vermelha
Concentração de cádmio na solução
em função da razão solo/solução



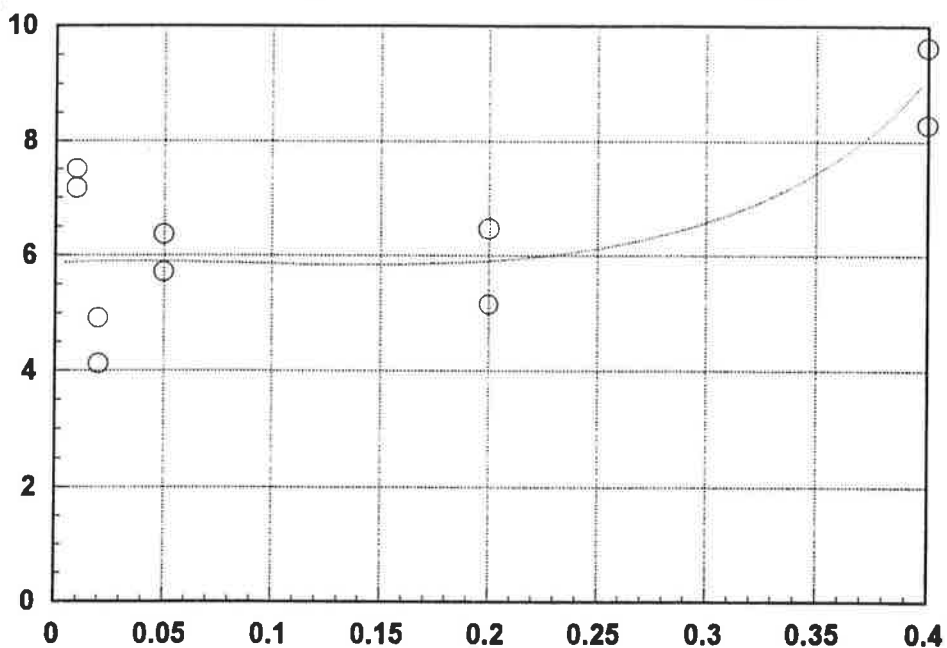
Ensaio de adsorção de mercúrio na argila vermelha
Concentração de ferro na solução
em função da razão solo/solução



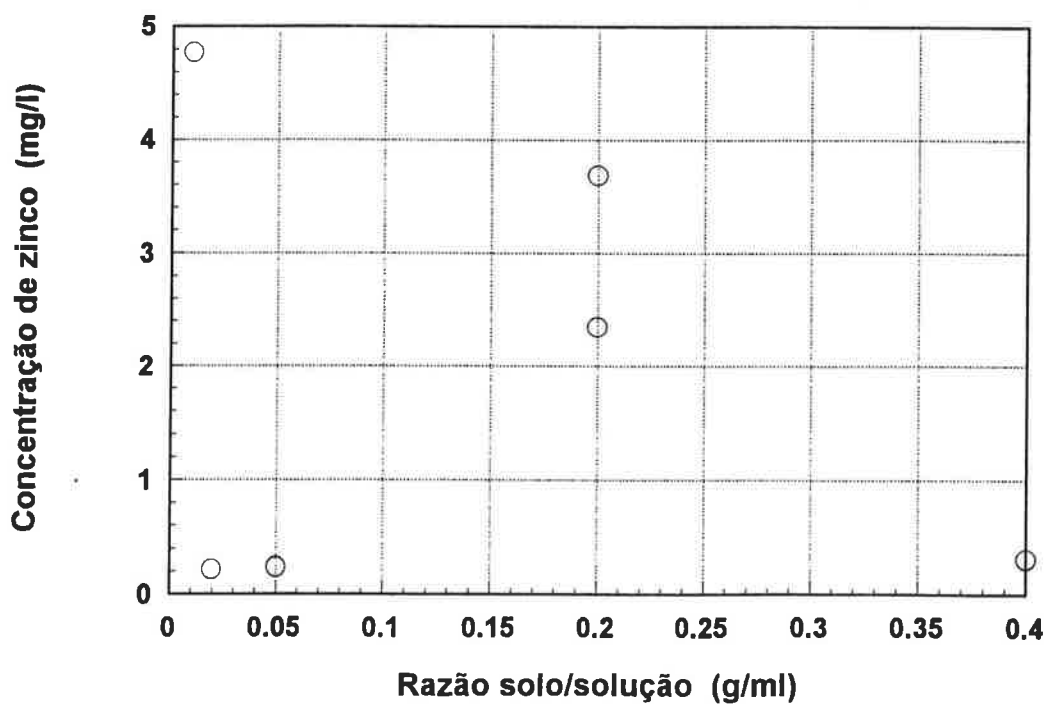
Ensaio de adsorção de mercúrio na argila vermelha
Concentração de manganês na solução
em função da razão solo/solução



Ensaio de adsorção de mercúrio na argila vermelha
Concentração de mercúrio na solução
em função da razão solo/solução



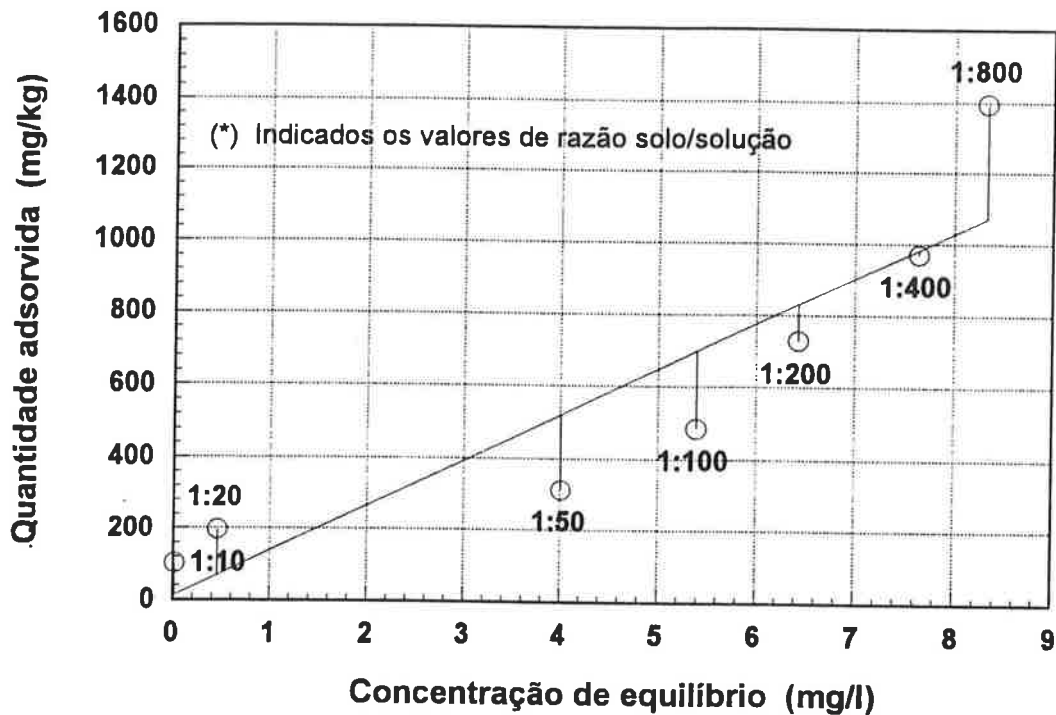
Ensaio de adsorção de mercúrio na argila vermelha
Concentração de zinco na solução
em função da razão solo/solução



Isoterma de adsorção de cádmio

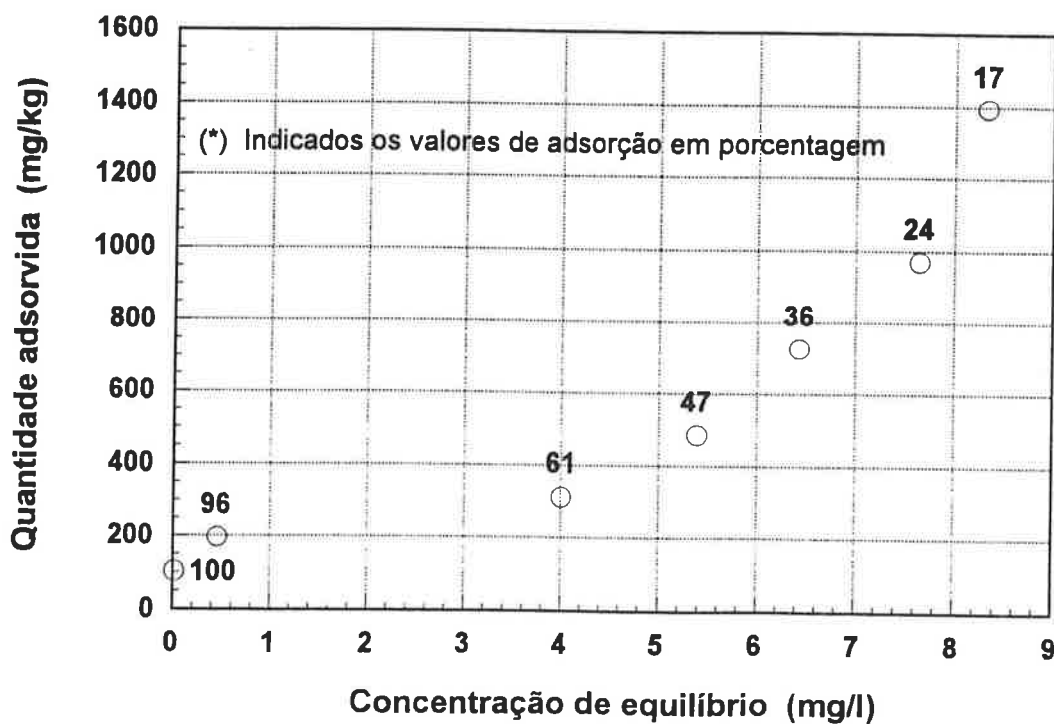
Bentonita

$$QA = 12 + 127 * CE$$

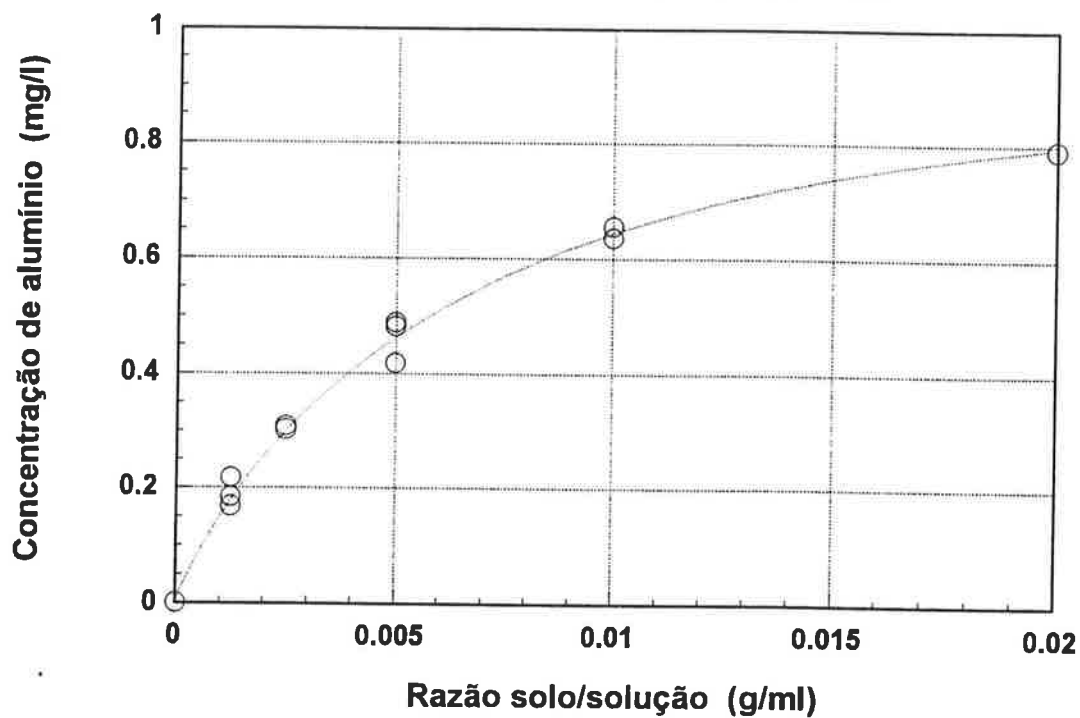


Isoterma de adsorção de cádmio

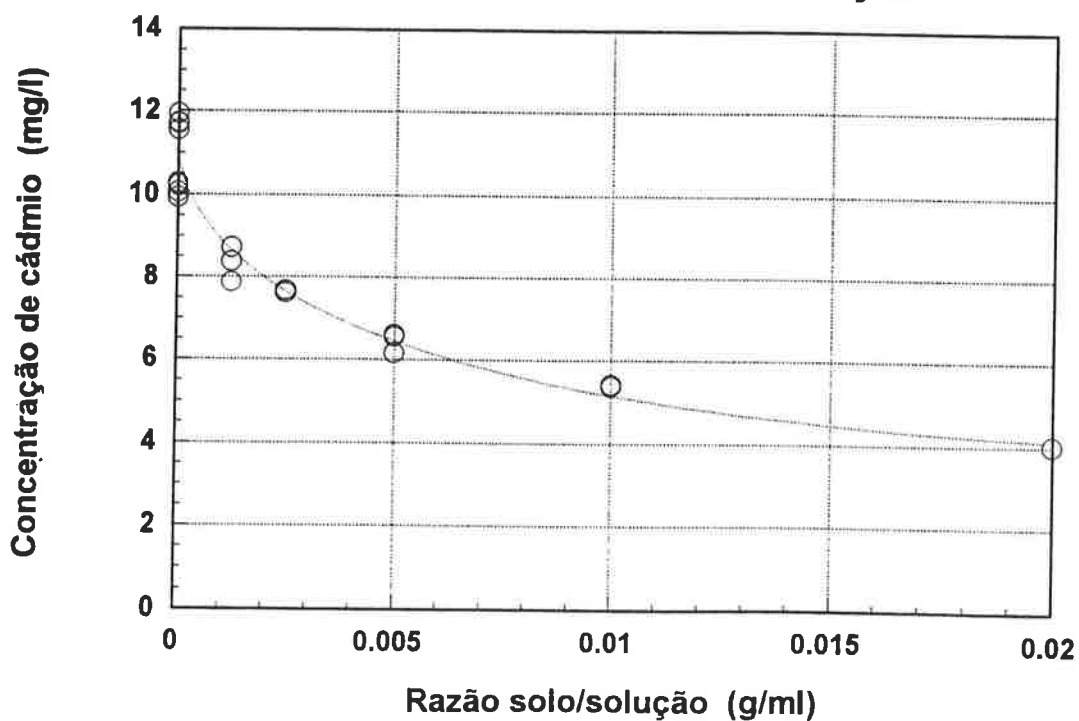
Bentonita



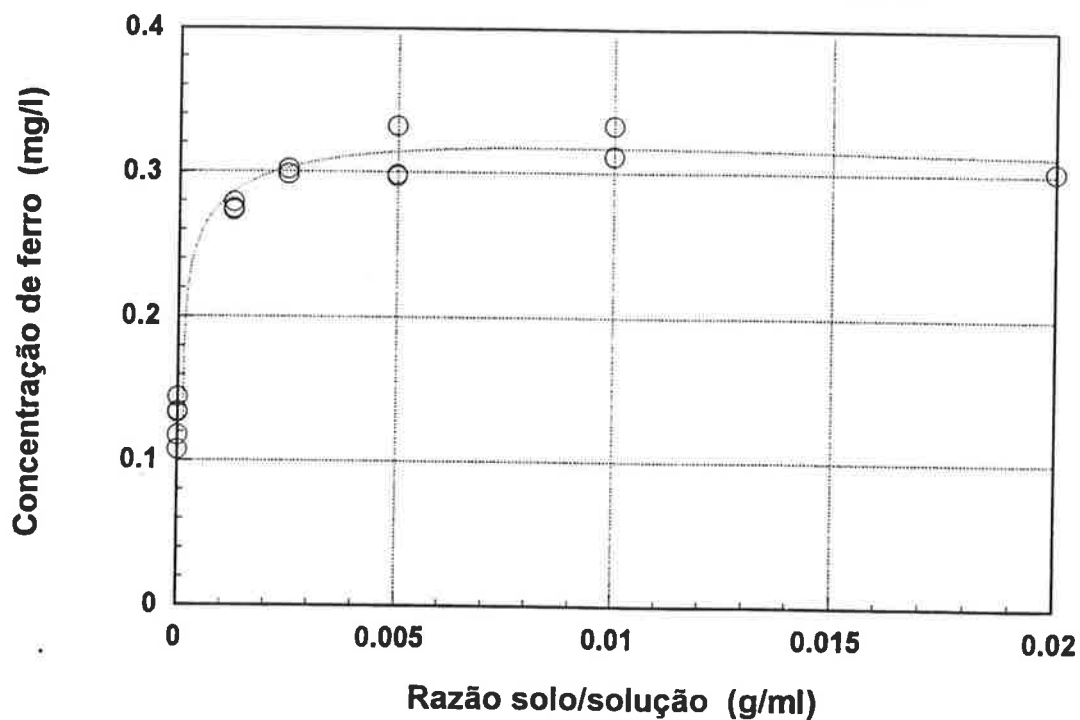
Ensaio de adsorção de cádmio na bentonita
Concentração de alumínio na solução
em função da razão solo/solução



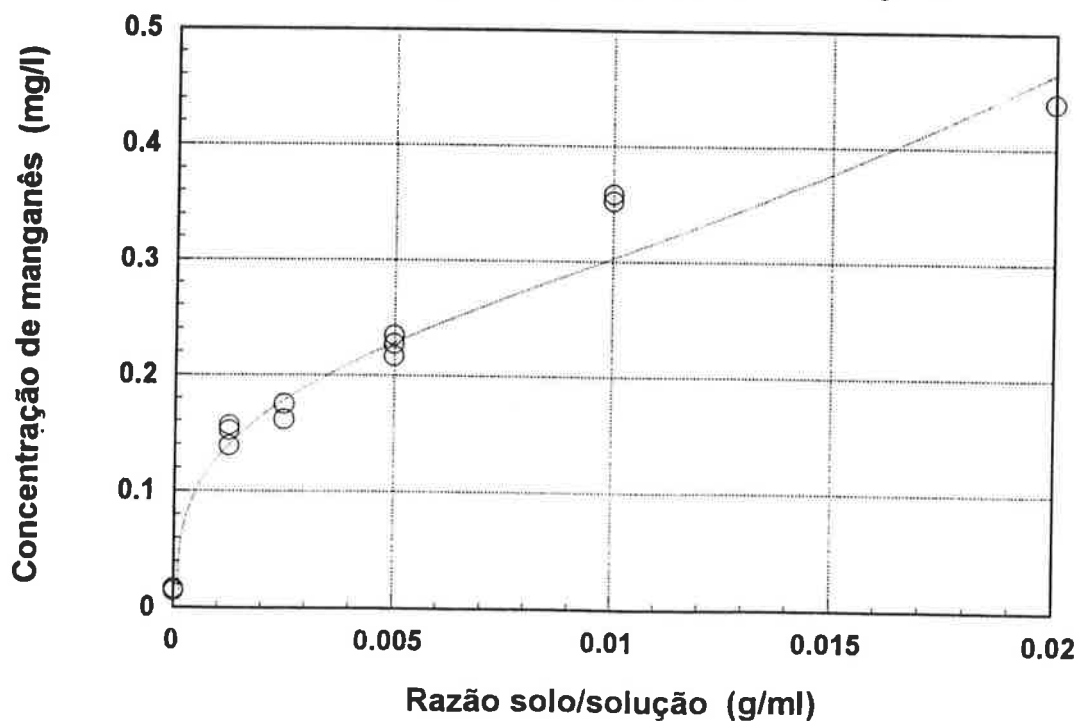
Ensaio de adsorção de cádmio na bentonita
Concentração de cádmio na solução
em função da razão solo/solução



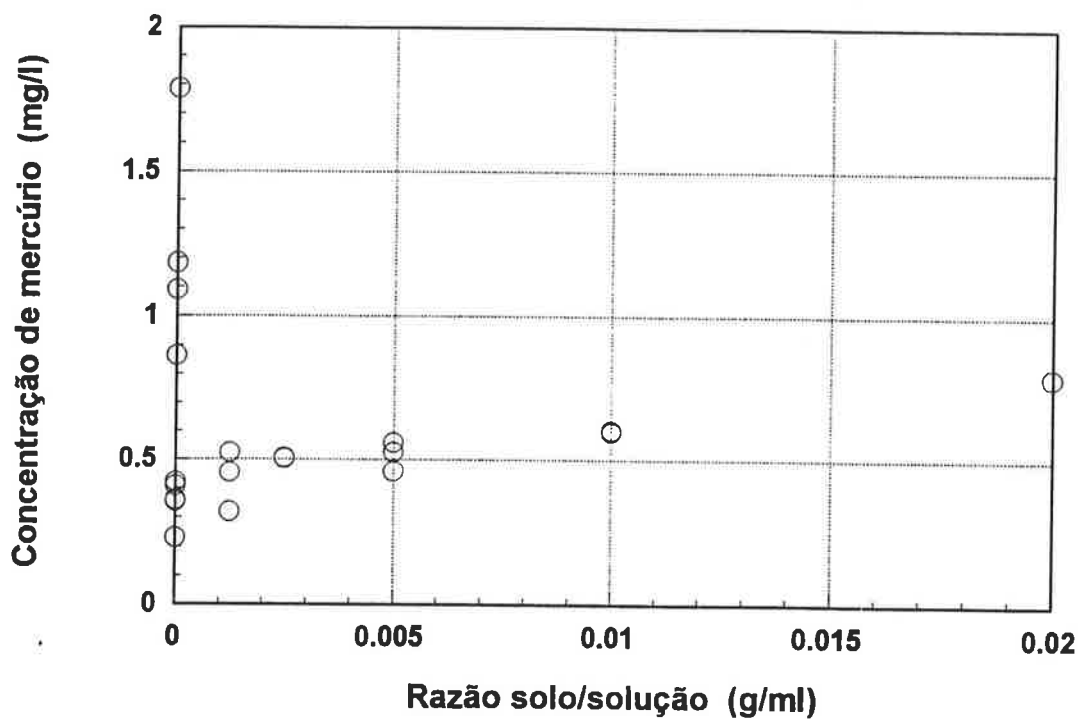
Ensaio de adsorção de cádmio na bentonita
Concentração de ferro na solução
em função da razão solo/solução



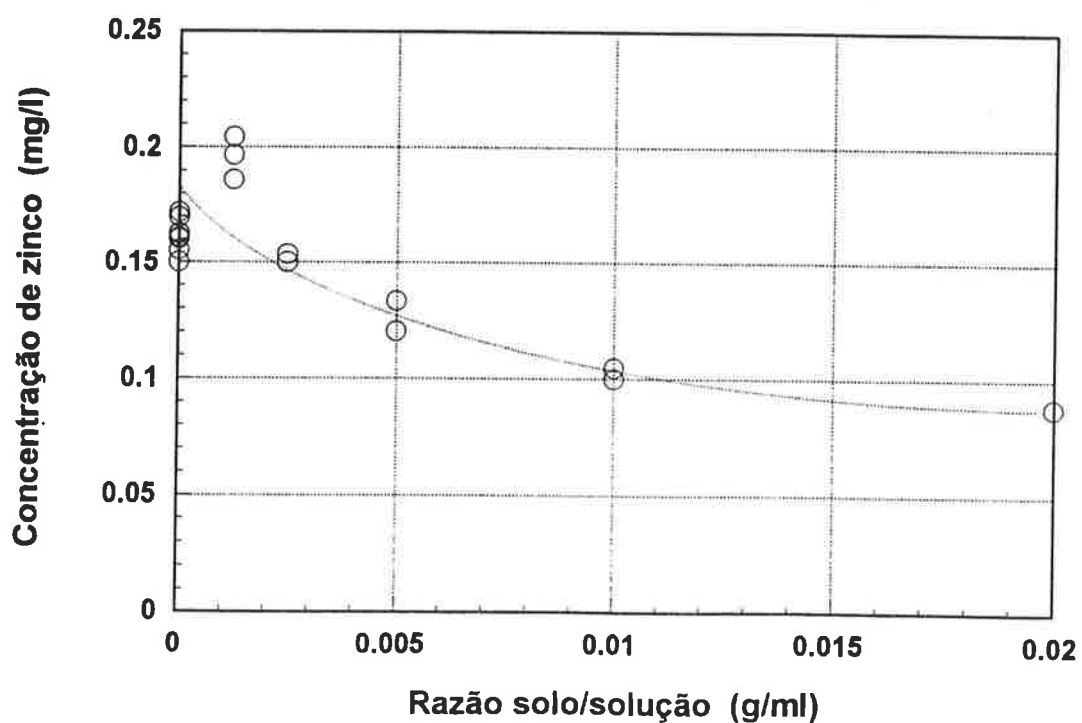
Ensaio de adsorção de cádmio na bentonita
Concentração de manganês na solução
em função da razão solo/solução



Ensaio de adsorção de cádmio na bentonita
Concentração de mercúrio na solução
em função da razão solo/solução

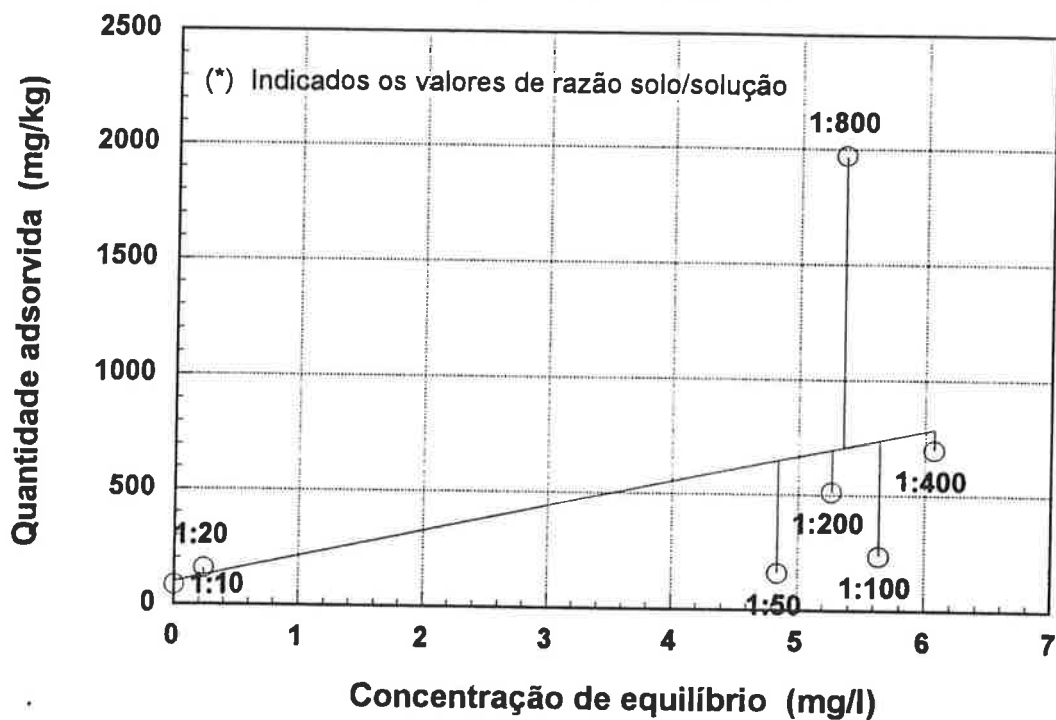


Ensaio de adsorção de cádmio na bentonita
Concentração de zinco na solução
em função da razão solo/solução

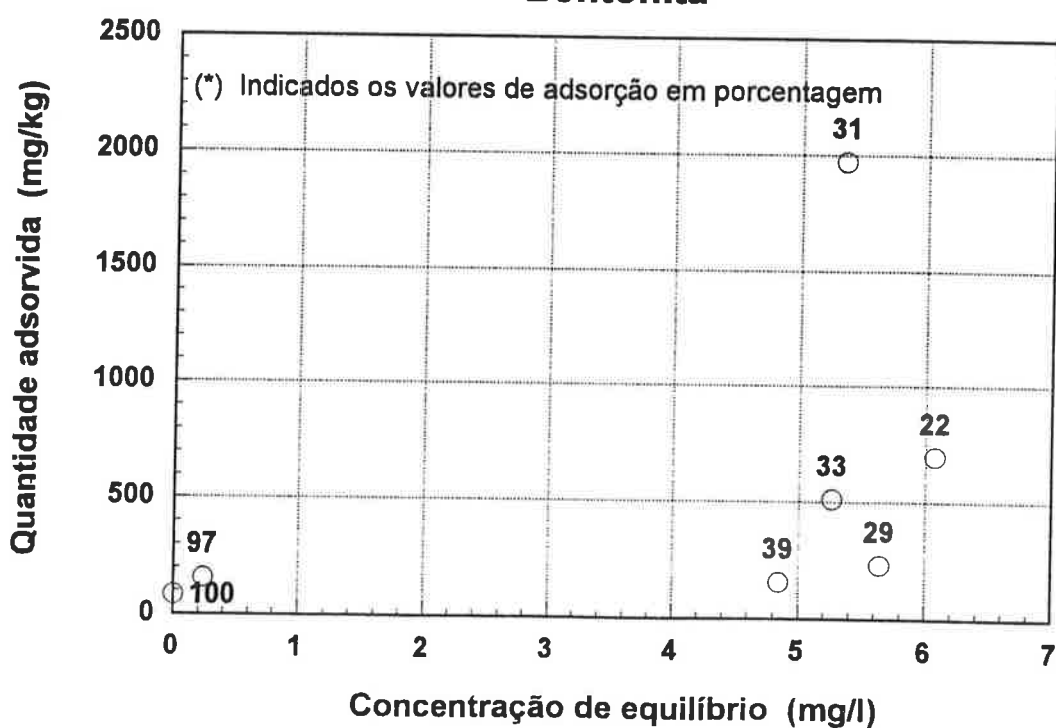


Isoterma de adsorção de mercúrio Bentonita

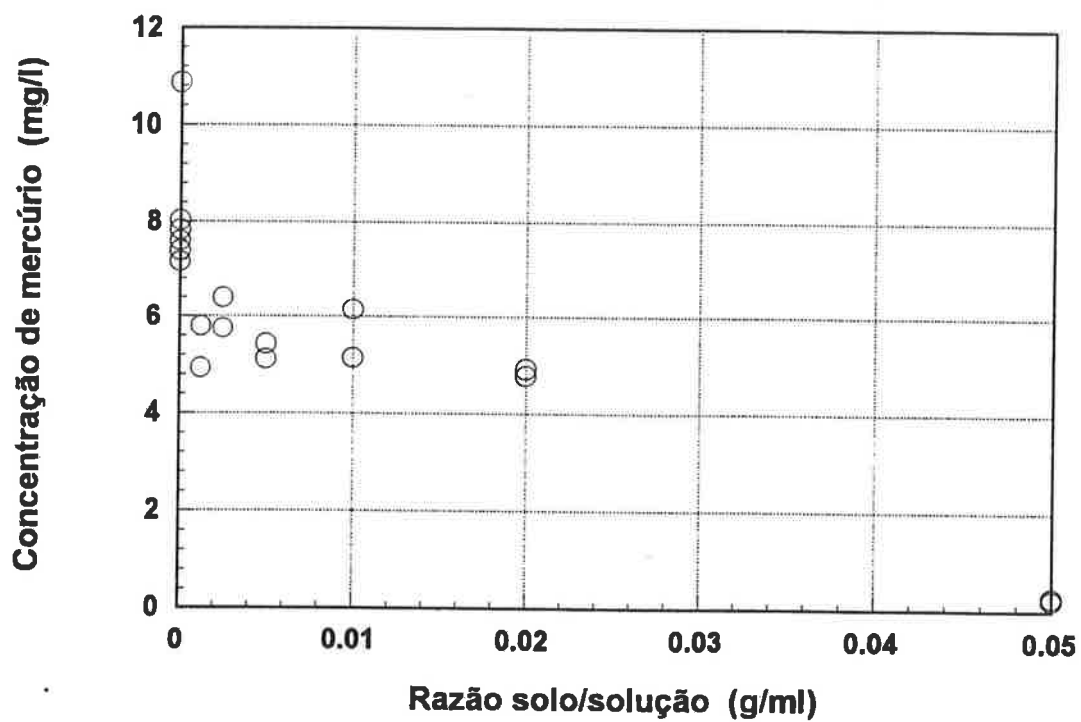
$$QA = 97 + 114 * CE$$



Isoterma de adsorção de mercúrio Bentonita

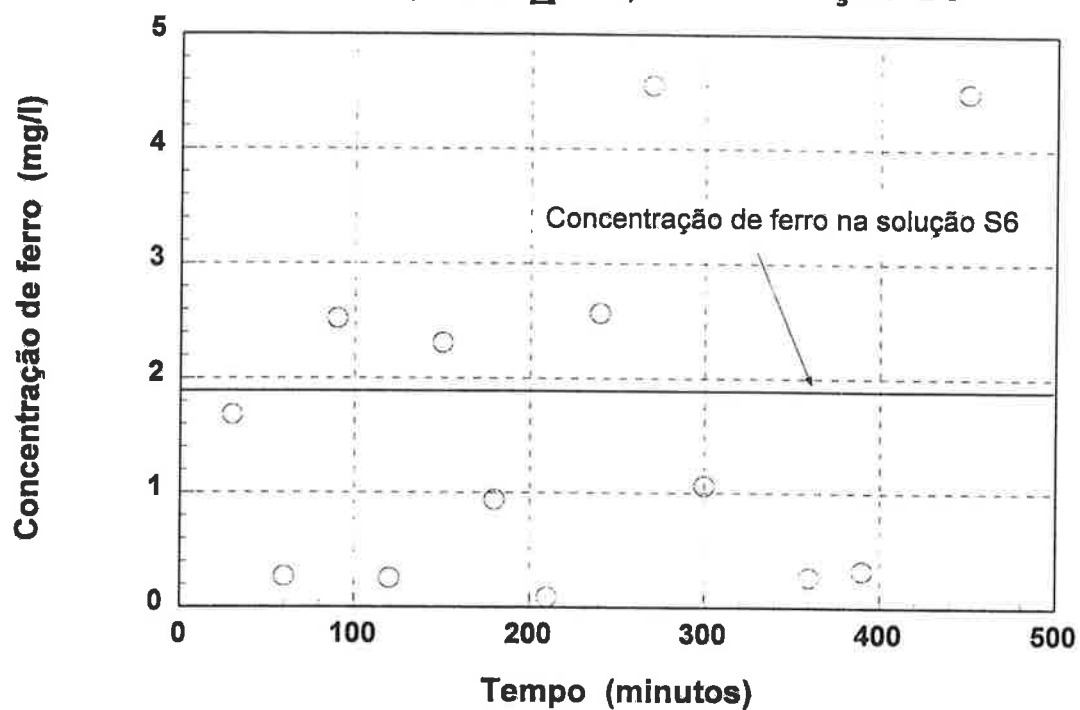
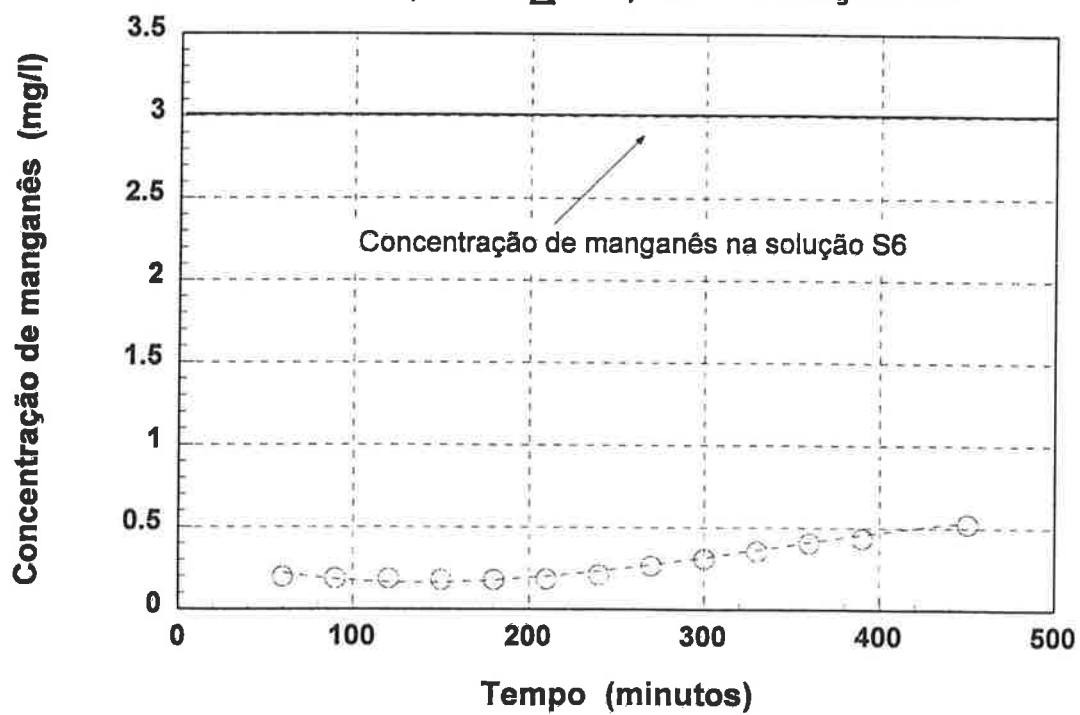


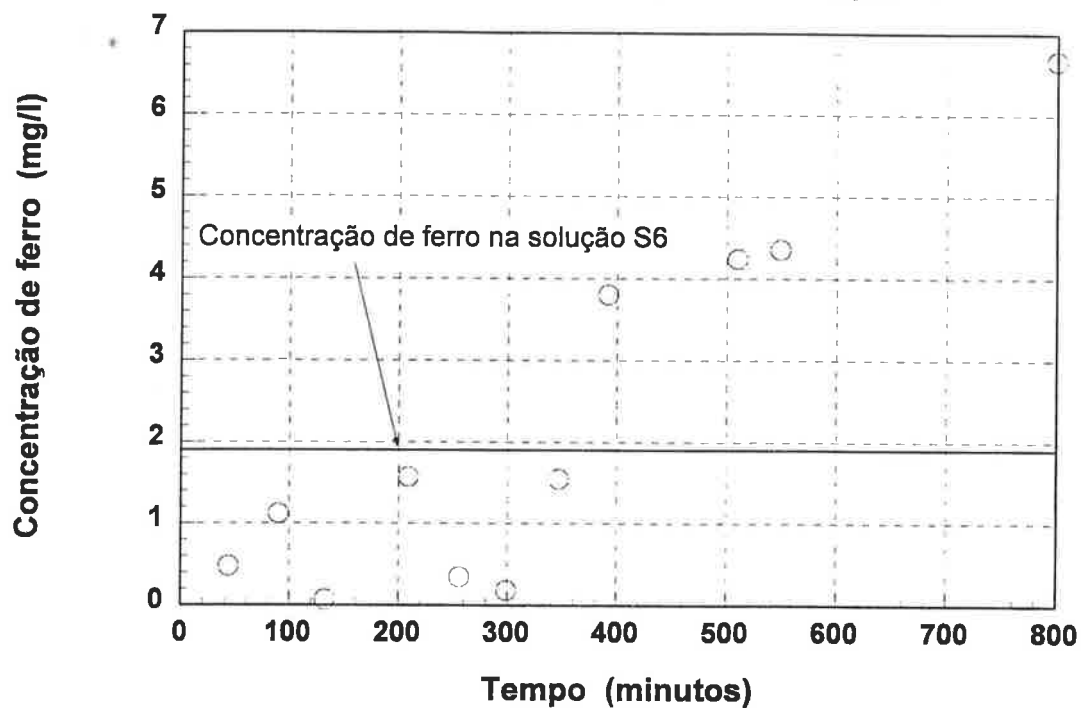
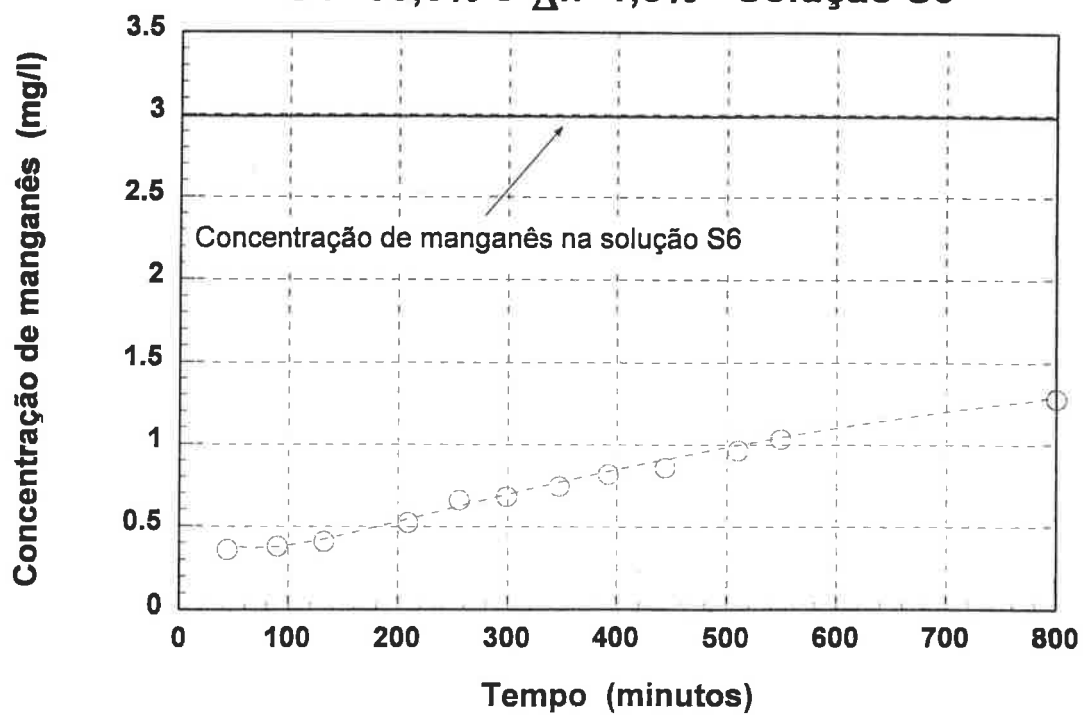
Ensaio de adsorção de mercúrio na bentonita
Concentração de mercúrio na solução
em função da razão solo/solução

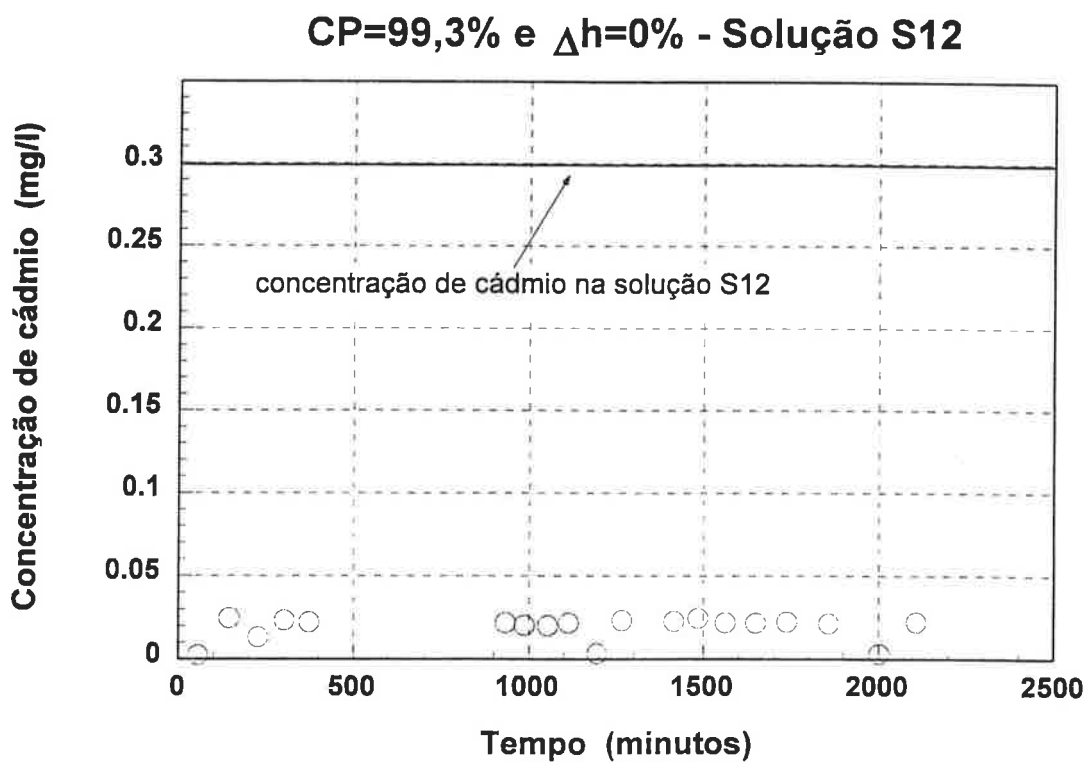
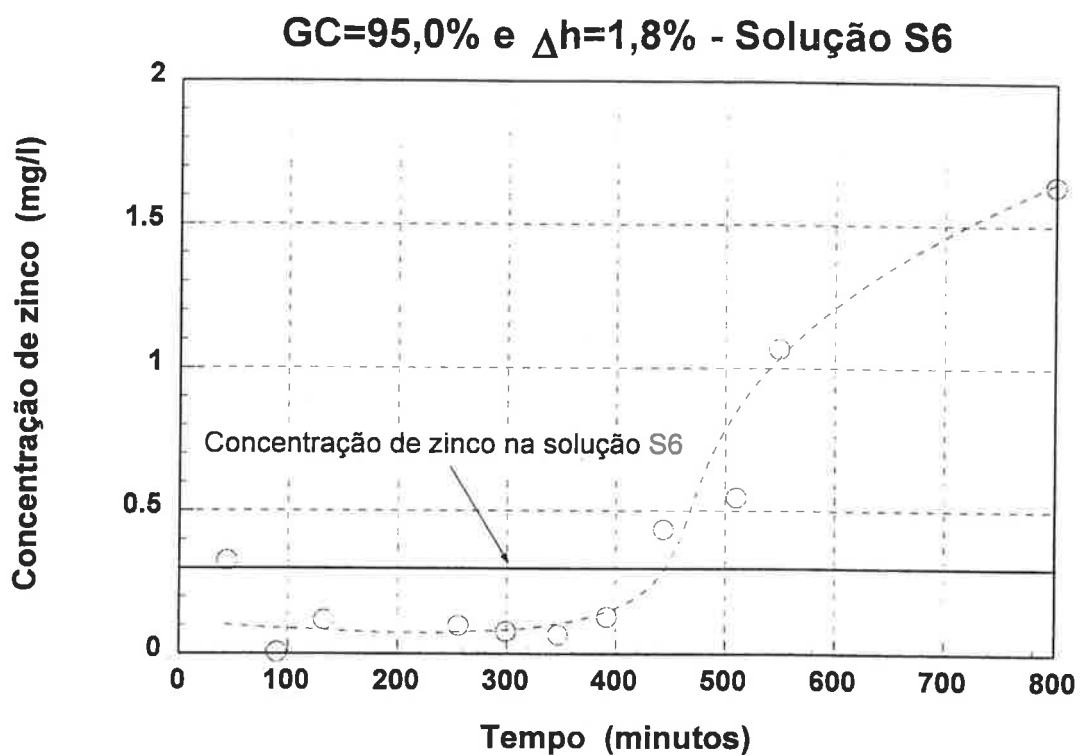


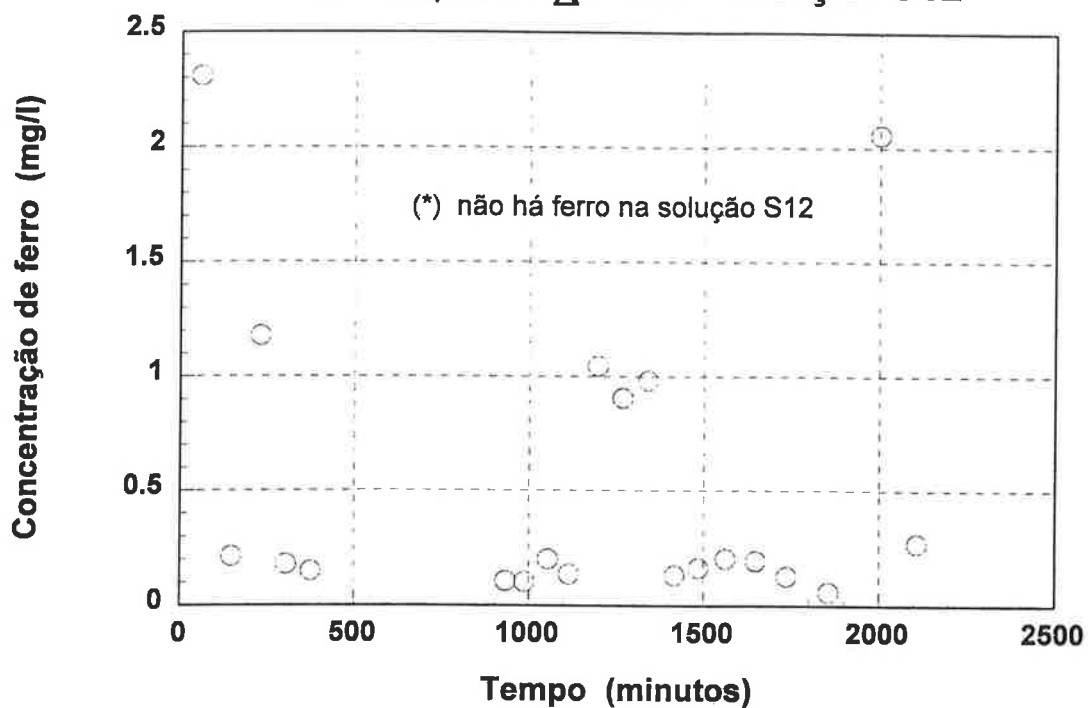
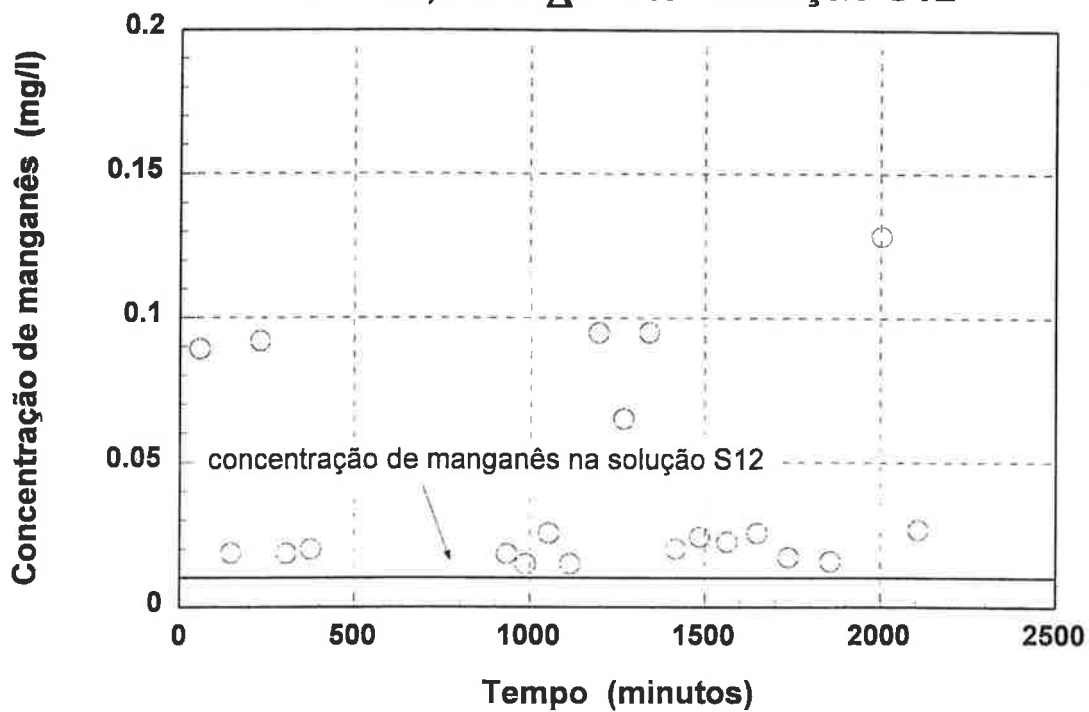
ANEXO L

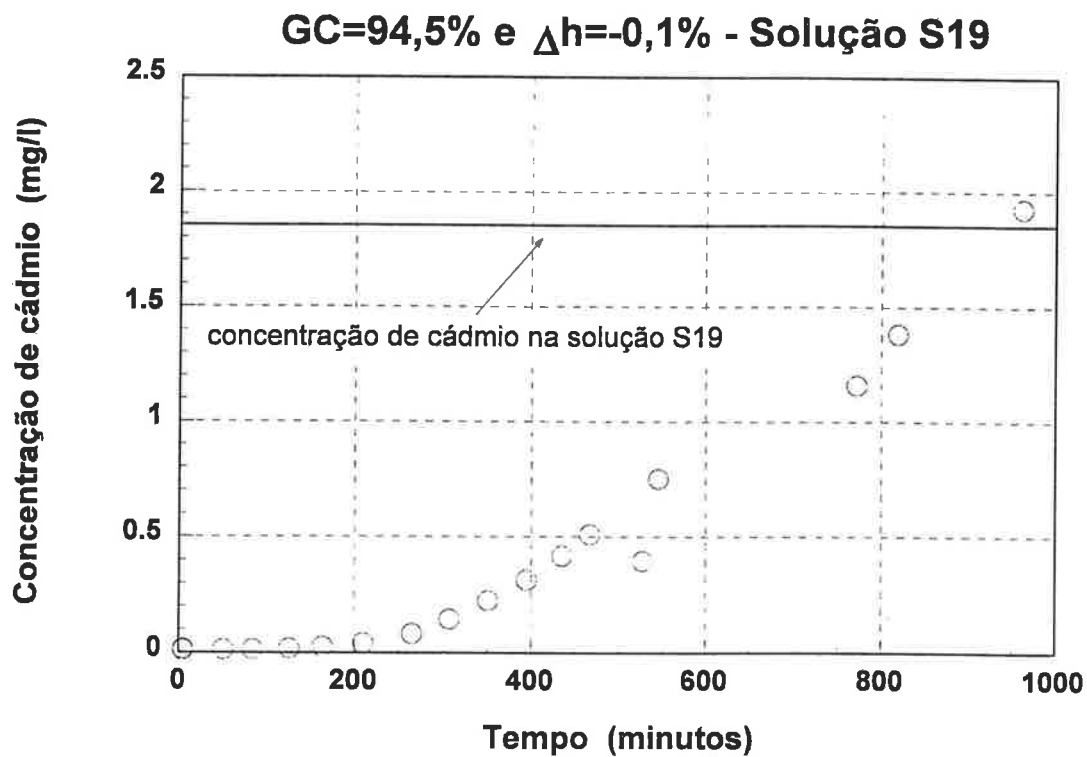
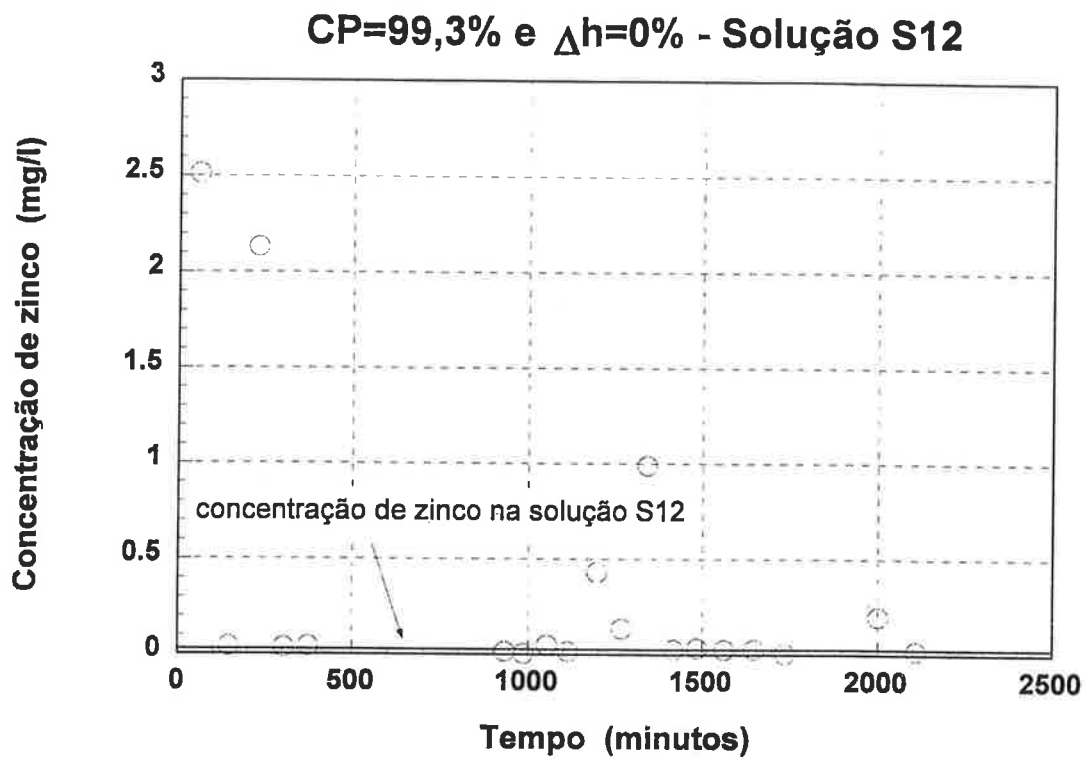
RESULTADOS DOS ENSAIOS DE DISPERSÃO

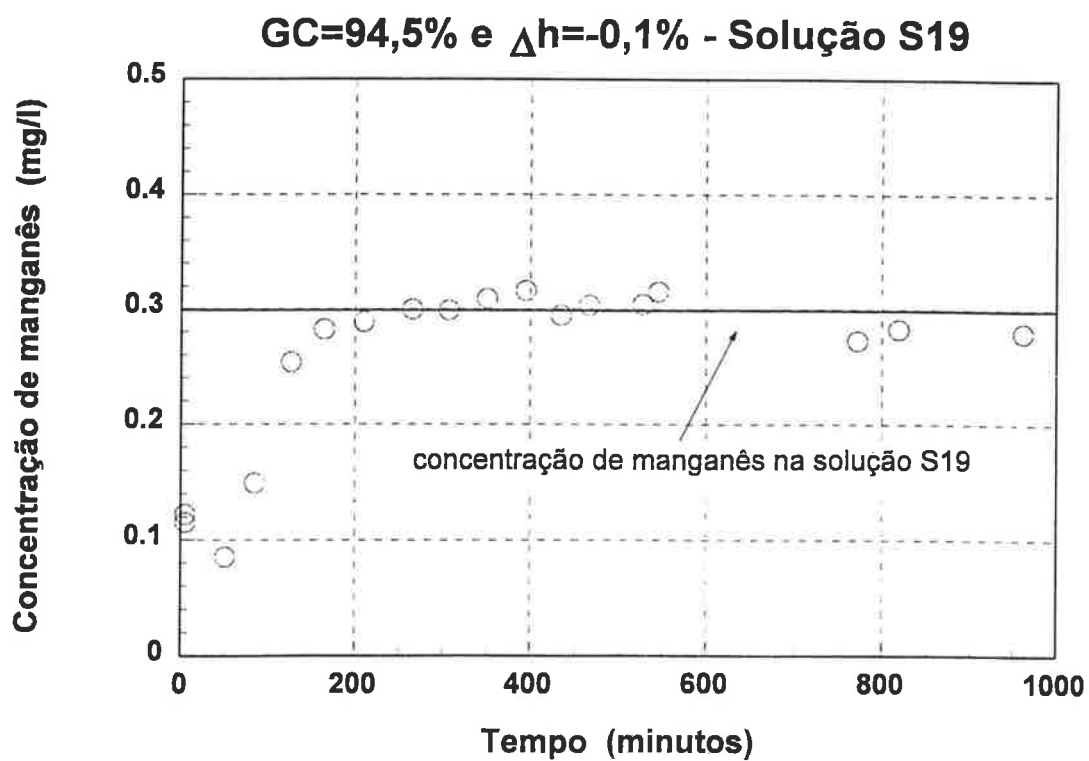
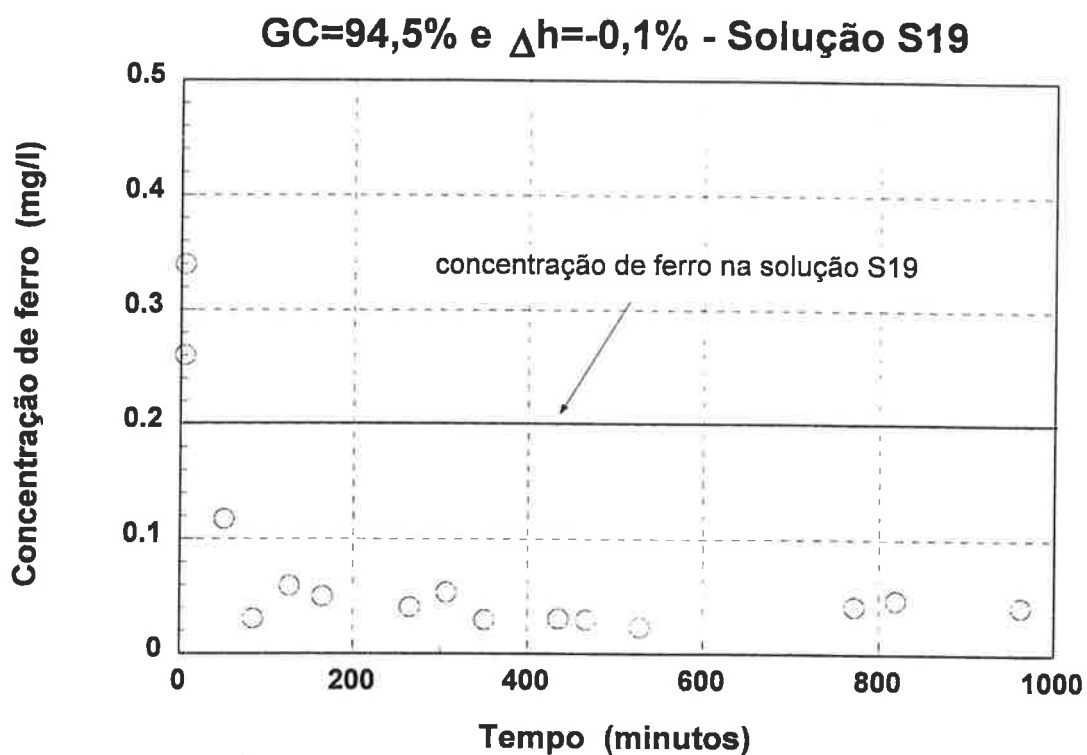
GC=94,5% e $\Delta h=0,2\%$ - Solução S6**GC=94,5% e $\Delta h=0,2\%$ - Solução S6**

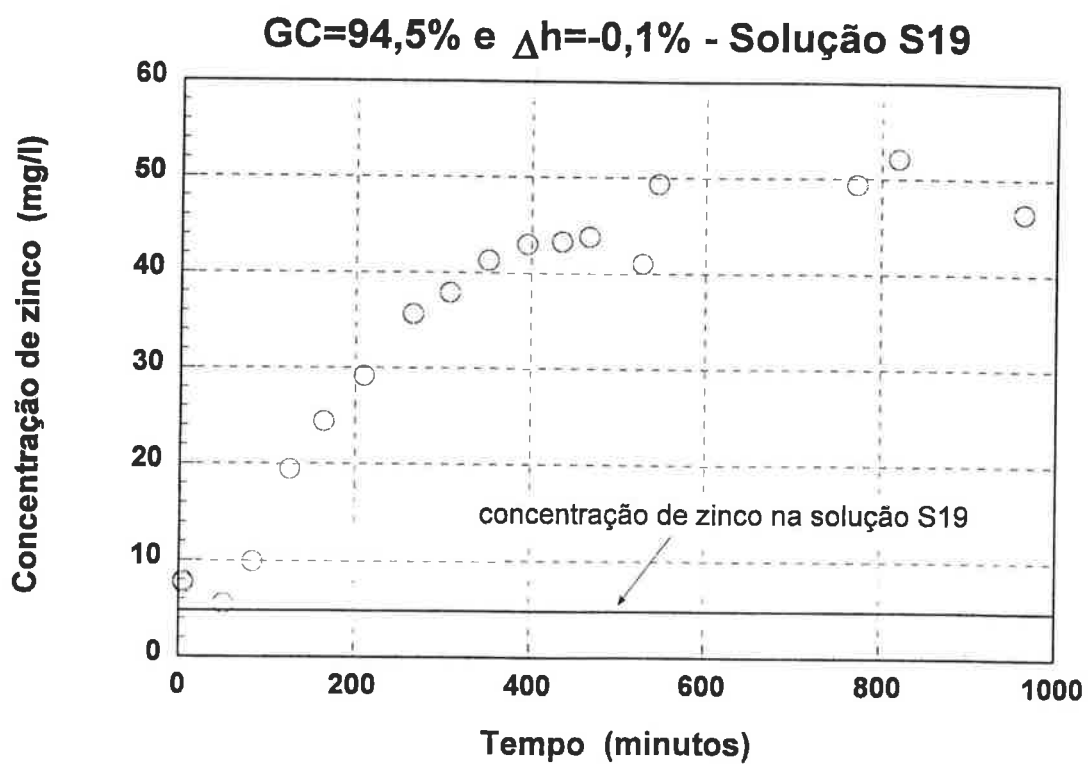
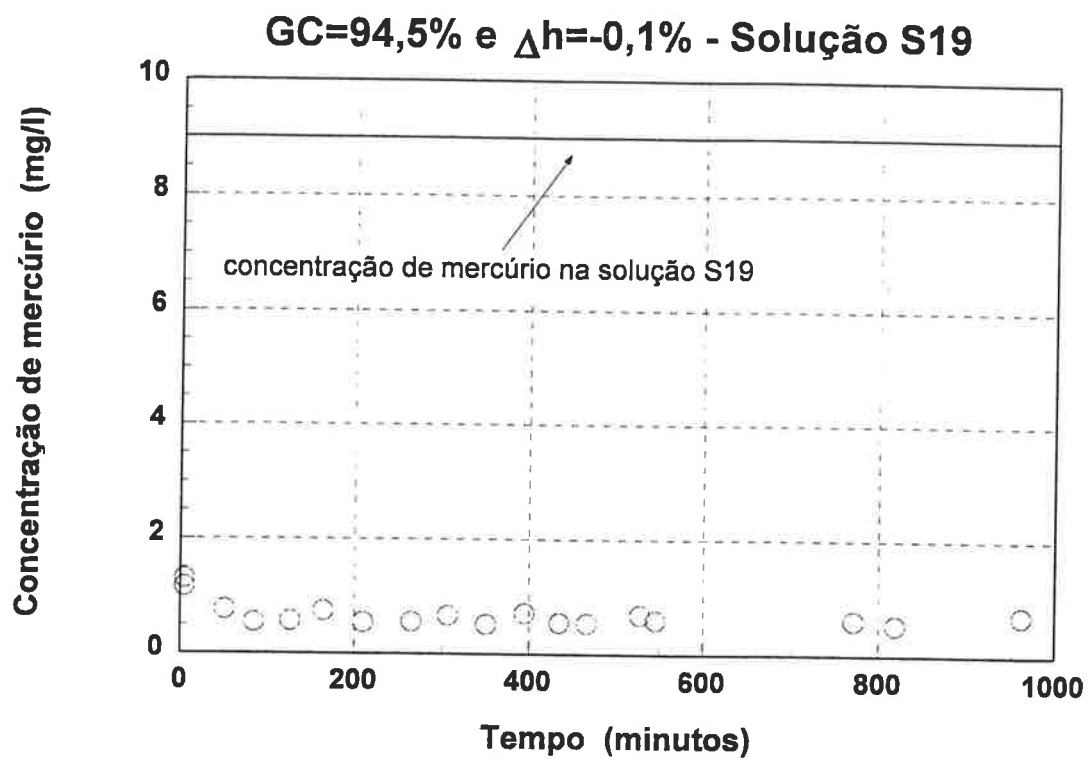
GC=95,0% e $\Delta h=1,8\%$ - Solução S6**GC=95,0% e $\Delta h=1,8\%$ - Solução S6**

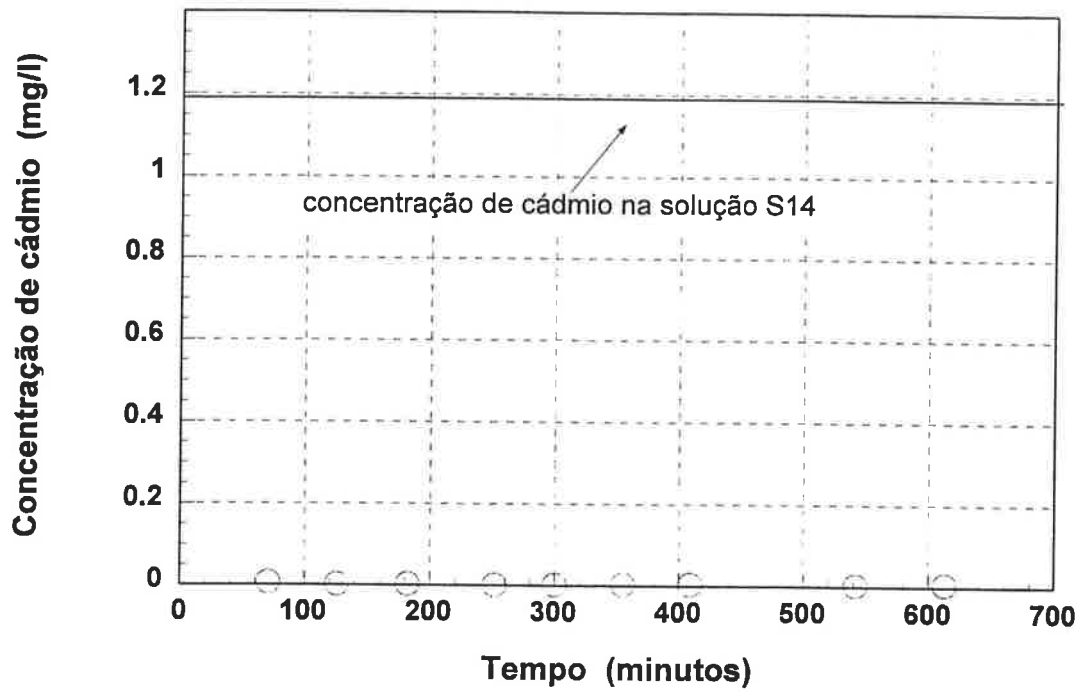
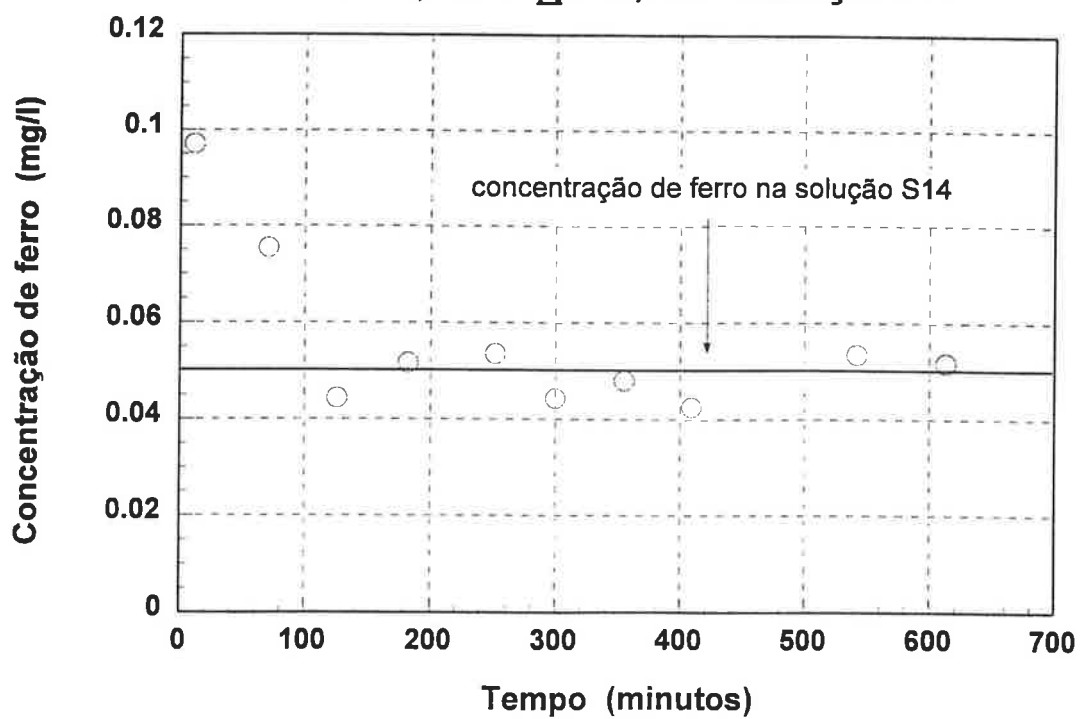


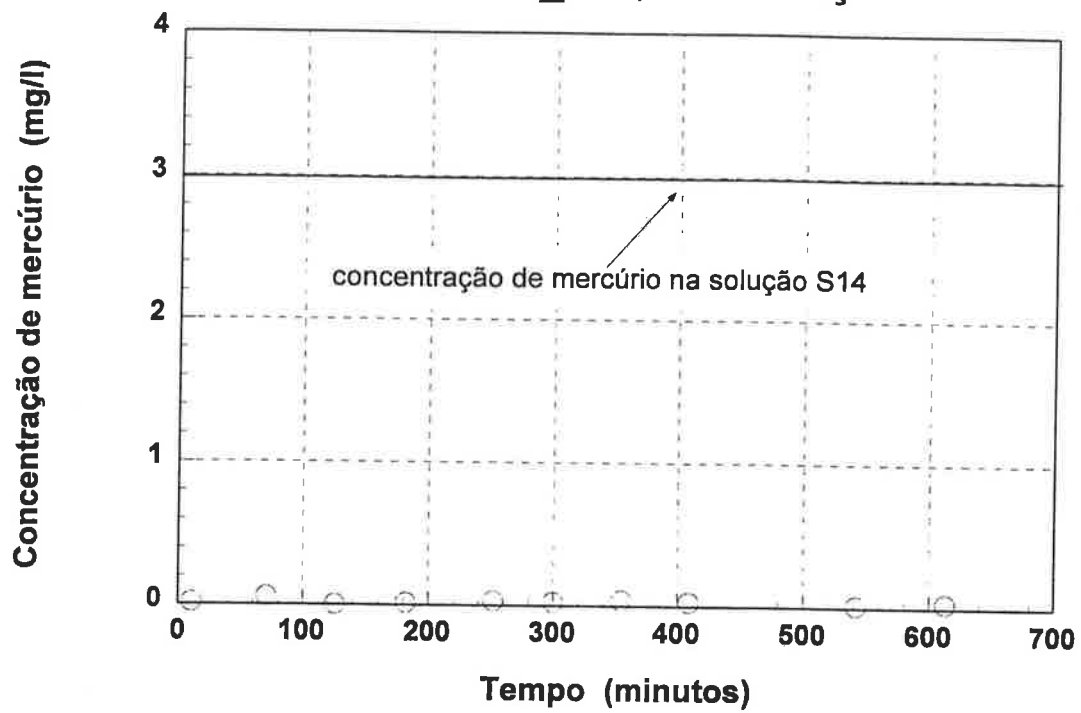
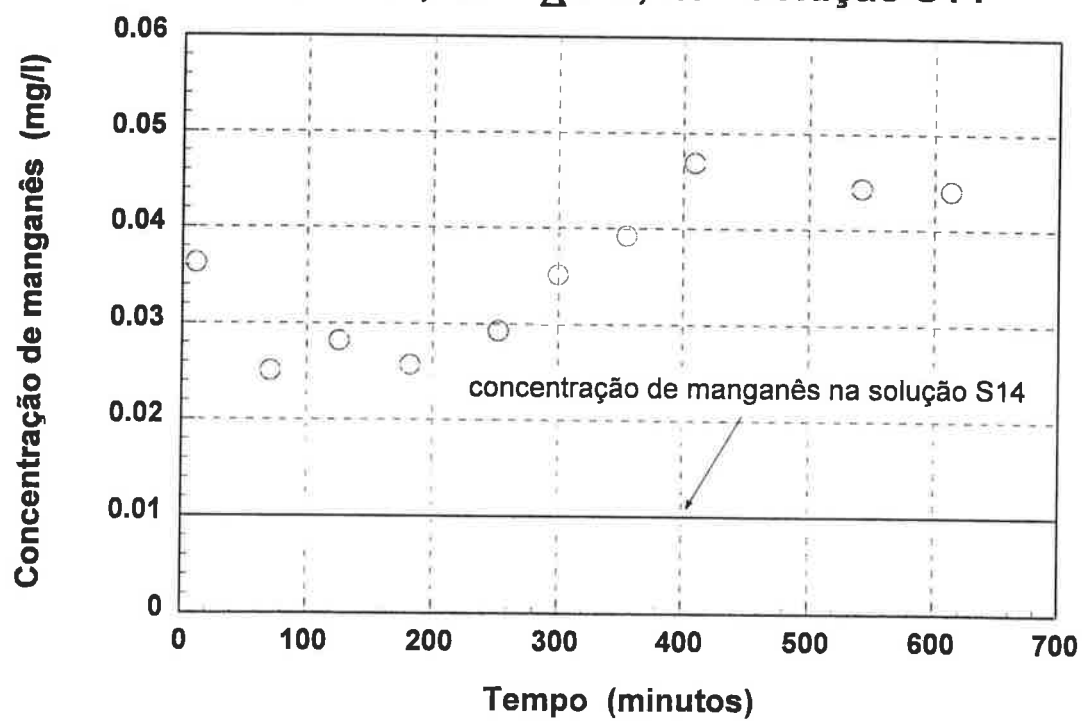
CP=99,3% e $\Delta h=0\%$ - Solução S12**CP=99,3% e $\Delta h=0\%$ - Solução S12**

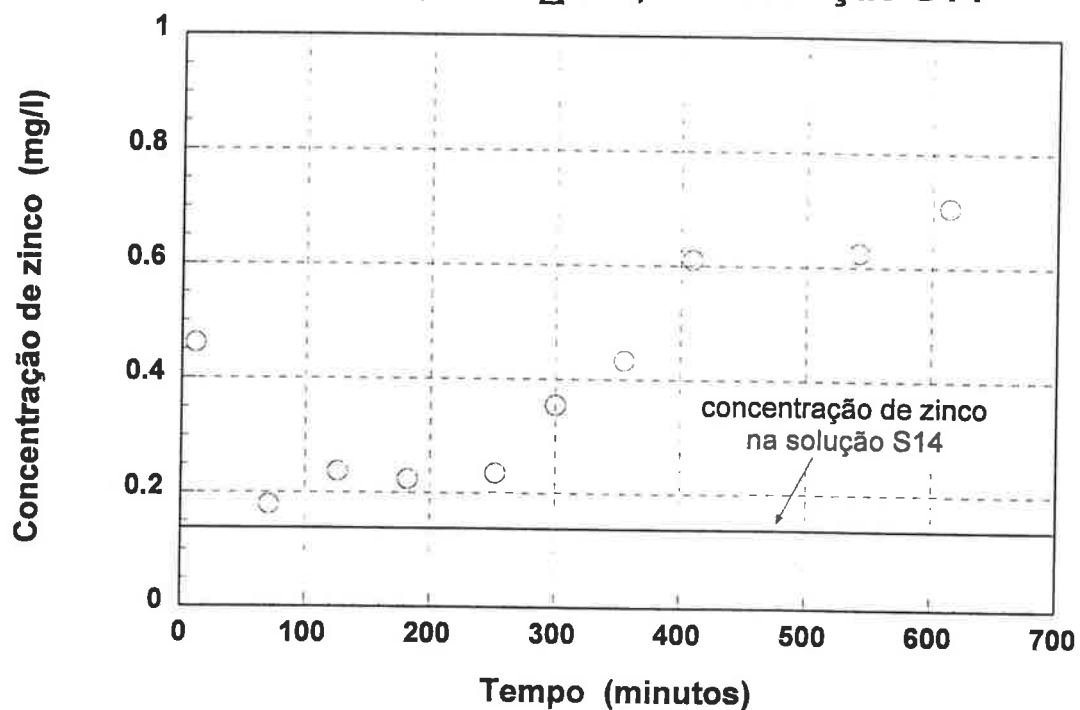
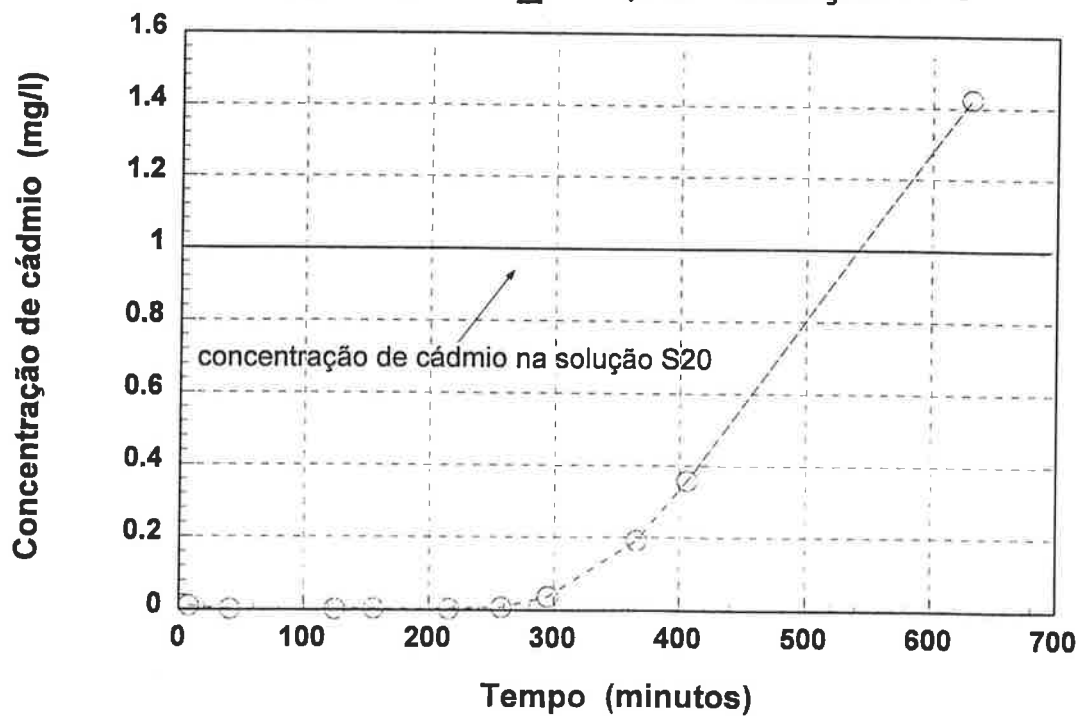


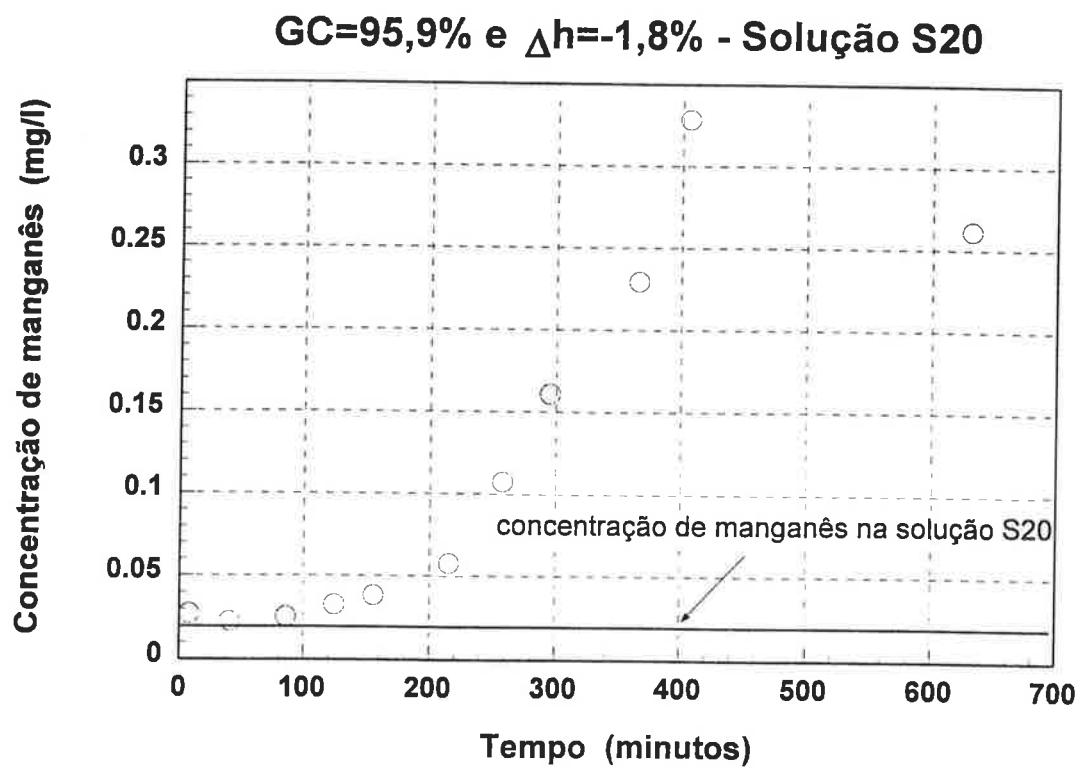
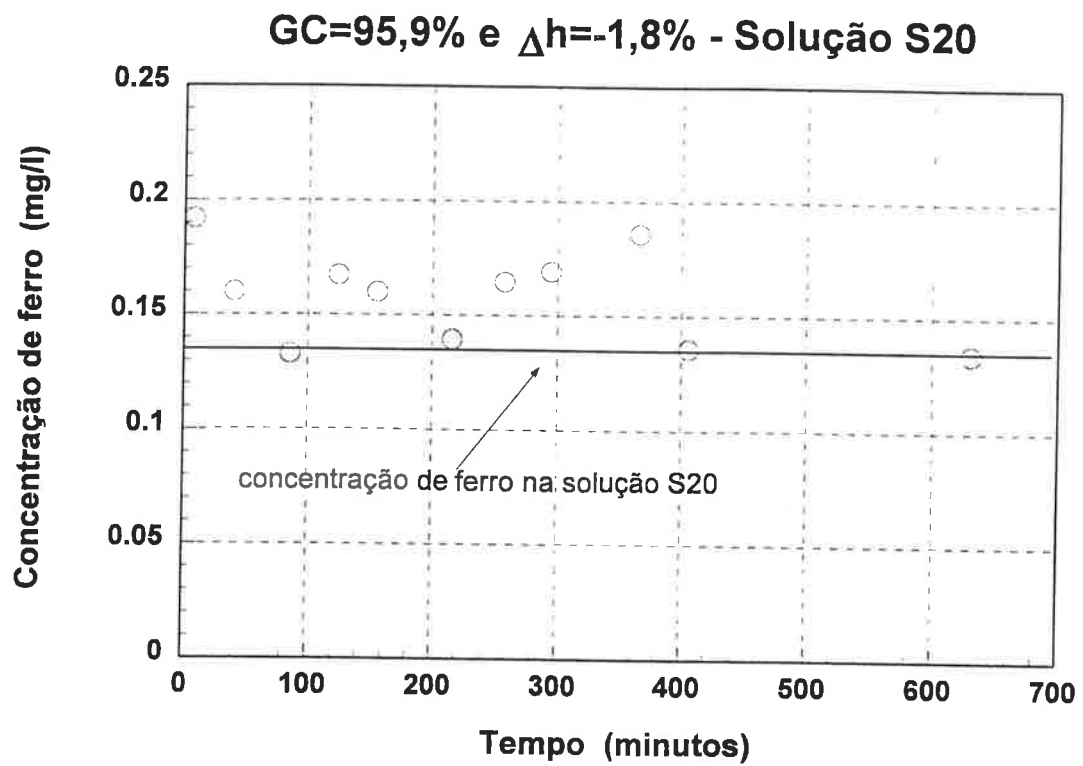


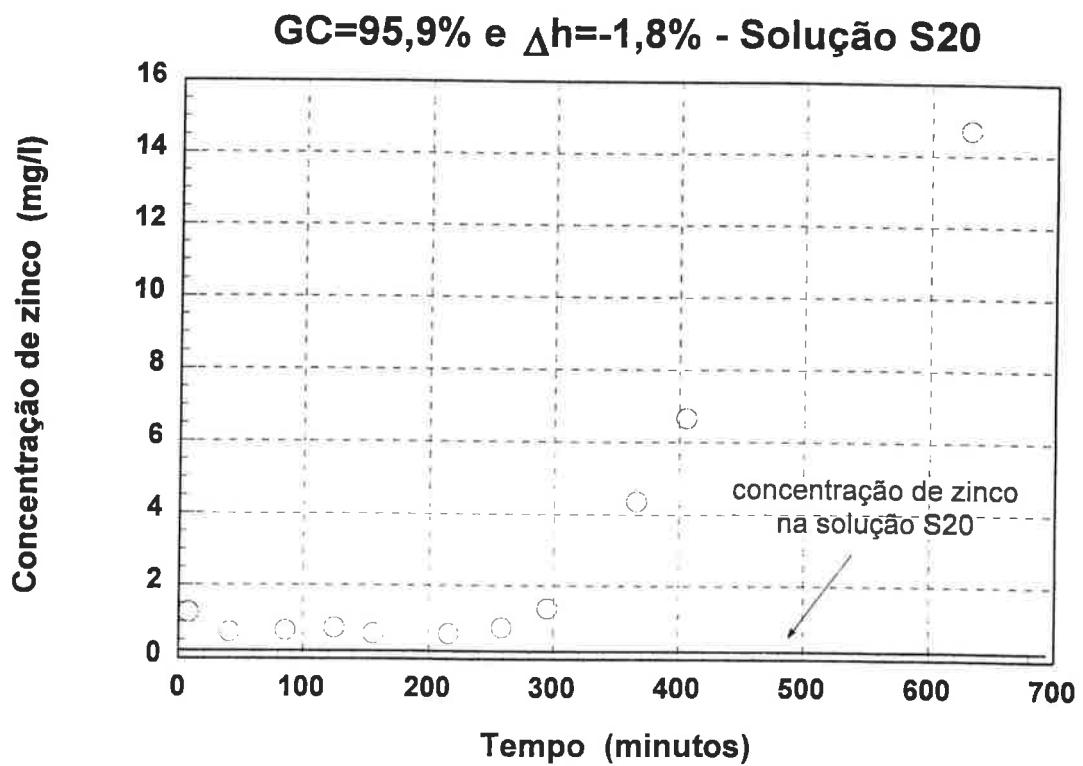
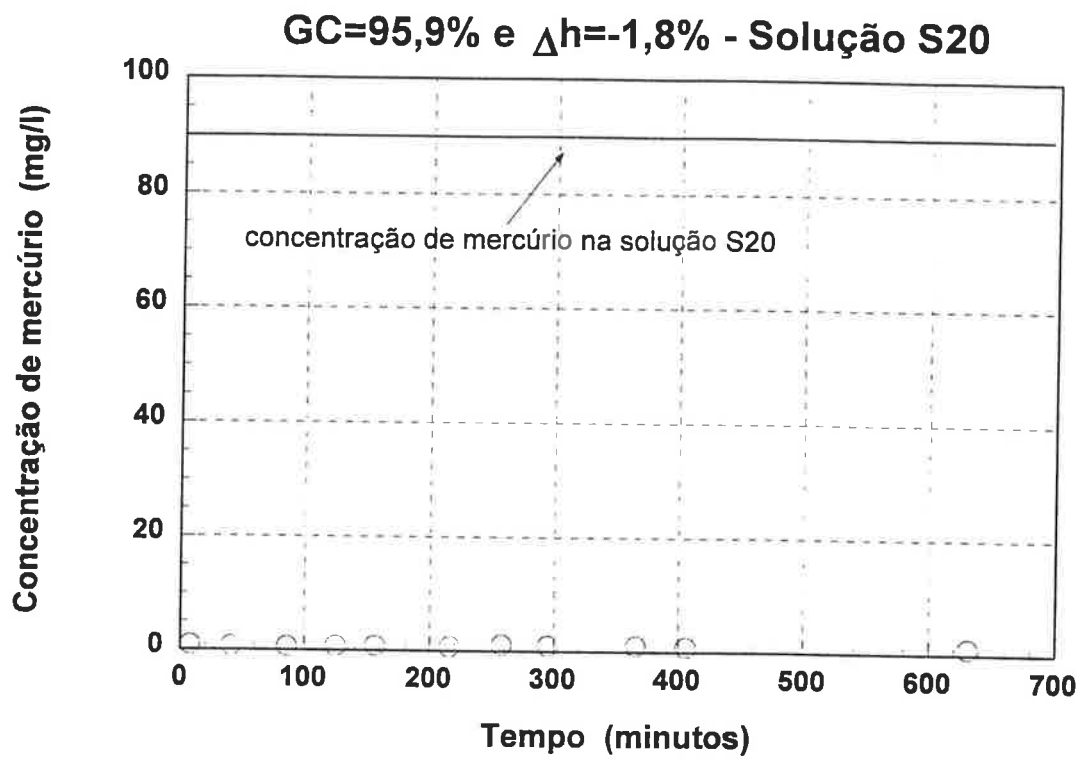


GC=94,7% e $\Delta h=2,1\%$ - Solução S14**GC=94,7% e $\Delta h=2,1\%$ - Solução S14**

GC=94,7% e $\Delta h=2,1\%$ - Solução S14GC=94,7% e $\Delta h=2,1\%$ - Solução S14

GC=94,7% e $\Delta h=2,1\%$ - Solução S14**GC=95,9% e $\Delta h=-1,8\%$ - Solução S20**





ANEXO M**RESULTADOS DOS ENSAIOS MINERALÓGICOS**

analyzed DI file : C:\APD\USER\PCC\PCC-ME-1.DI
 sample identification: PCC-M EUGENIA-1
 first database used : C:\IDENT\IDENTDB
 second database used : C:\IDENT\EXAMPLDB
 restrictions file : MEGB.RES

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results:

Card Id	Match score	Rel m score	I [%]	Displ [m]	Formula		
1	33-1161	19.34	0.77	48	-99	SiO2	
2	05-0490	19.09	0.76	50	-92	SiO2	*
3	14-0164	25.00	0.37	3	-56	Al2Si2O5(OH)4	
4	34-0170	24.64	0.35	3	-18	Al2Si2O5(OH)4	
5	16-0606	24.12	0.34	3	-68	Al2Si2O5(OH)4	
6	44-1496	21.67	0.35	5	-47	NaAlSiO4	
7	07-0324	16.74	0.42	15	-4	Al(OH)3	*
8	33-0018	17.75	0.38	2	-64	Al(OH)3	
9	13-0002	18.06	0.34	4	8	Al2Si2O5(OH)4	*
10	10-0430	14.37	0.37	1	-145	Al2Si2O5(OH)4	
11	10-0446	13.76	0.35	1	-132	Al2Si2O5(OH)4	
12	06-0221	10.38	0.45	5	-76	Al2Si2O5(OH)4	*
13	13-0534	7.83	0.43	4	-137	Fe2O3	*
14	22-1163	11.92	0.28	7	111	Mg3Si2O5(OH)4	
15	34-0163	10.33	0.30	7	-46	(Mg,Al)3SiAlO5(OH)4	
16	14-0172	3.49	0.87	9	-122	(Mn,Mg,Fe)SiO3!H2O	
17	03-0849	10.59	0.29	1	-39	H4K2(Al,Fe)6Si6O24	
18	13-0257	8.12	0.37	1	30	Mg3(OH)4Si2O5	
19	43-1456	8.99	0.33	4	-137	Na0.55Mn2O4!1.5H2O	
20	03-0800	6.99	0.39	2	111	Fe2O3	

analyzed DI file : C:\APD\USER\PCC\PCC-ME-1.DI
 Sample identification: PCC-M EUGENIA-1
 First database used : C:\IDENT\IDENTDB
 Second database used : C:\IDENT\EXAMPLDB
 Restrictions file : MEGB.RES

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Results:

	Card. ident.	Match score	Rel m score	I [%]	Displ [m]	Name	
1	33-1161	19.34	0.77	48	-99	Quartz, syn	
2	05-0490	19.09	0.76	50	-92	Quartz, low	*
3	14-0164	25.00	0.37	3	-56	Kaolinite-1A	
4	34-0170	24.64	0.35	3	-18	Nacrite-2M2	
5	16-0606	24.12	0.34	3	-68	Nacrite-2M2	
6	44-1496	21.67	0.35	5	-47	low-carnegieite	
7	07-0324	16.74	0.42	15	-4	Gibbsite	*
8	33-0018	17.75	0.38	2	-64	Gibbsite, syn	
9	13-0002	18.06	0.34	4	8	Nacrite	*
10	10-0430	14.37	0.37	1	-145	Dickite	
11	10-0446	13.76	0.35	1	-132	Dickite-2M1	
12	06-0221	10.38	0.45	5	-76	Kaolinite 1Md	*
13	13-0534	7.83	0.43	4	-137	Hematite, syn	*
14	22-1163	11.92	0.28	7	111	Clinochrysoile, syn	
15	34-0163	10.33	0.30	7	-46	Amesite-2H	
16	14-0172	3.49	0.87	9	-122	Neotocite	
17	03-0849	10.59	0.29	1	-39	Muscovite	
18	13-0257	8.12	0.37	1	30	Stevensite	
19	43-1456	8.99	0.33	4	-137	Birnessite, syn	
20	03-0800	6.99	0.39	2	111	Hematite	

Analyzed DI file : C:\APD\USER\PCC\PCC-ME-2.DI
 Sample identification: PCC-M EUGENIA-2
 First database used : C:\IDENT\IDENTDB
 Second database used : C:\IDENT\EXAMPLDB
 Restrictions file : MEGB.RES

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Results:

	Card Id	Match score	Rel m score	I [%]	Displ [m]	Formula	
1	05-0490	18.54	0.74	50	-18	SiO2	*
2	33-1161	18.37	0.73	48	-51	SiO2	
3	14-0172	2.87	0.72	11	-14	(Mn,Mg,Fe)SiO3!H2O	*
4	29-0704	3.96	0.57	13	37	(Mg,Mn,Fe,Zn)3(Si,Al)2O5(*
5	06-0221	10.67	0.46	10	-36	Al2Si2O5(OH)4	*
6	29-0041	17.49	0.45	30	12	Al(OH)3	*
7	07-0324	17.67	0.44	16	-4	Al(OH)3	
8	33-0018	19.36	0.41	10	-3	Al(OH)3	
9	14-0614	8.23	0.41	5	-104	Mn1.60Mn0.32O3.10(OH)0.90	
10	10-0430	15.81	0.41	1	-122	Al2Si2O5(OH)4	
11	10-0446	15.30	0.39	2	-79	Al2Si2O5(OH)4	
12	43-1456	10.11	0.37	6	-132	Na0.55Mn2O4!1.5H2O	
13	14-0164	24.62	0.37	3	-36	Al2Si2O5(OH)4	
14	34-0170	23.66	0.33	15	8	Al2Si2O5(OH)4	
15	44-1496	20.49	0.33	4	62	NaAlSiO4	
16	42-1335	7.91	0.33	2	-117	(Zn5Al)(Si3Al)O10(OH)8	
17	16-0606	23.38	0.33	10	-14	Al2Si2O5(OH)4	
18	13-0534	5.92	0.33	5	-22	Fe2O3	*
19	11-0386	6.89	0.33	2	-122	(Mg,Al)3(Si,Al)2O5(OH)4	
20	31-0782	11.46	0.33	3	-145	(Mg,Al)3(Si,Al)2O5(OH)4	
21	38-0758	9.64	0.32	2	-46	AlH3	
22	13-0002	16.80	0.32	2	62	Al2Si2O5(OH)4	
23	29-1410	10.52	0.31	1	-47	CaAl2SiO4(OH)4	
24	22-1163	12.87	0.31	10	-3	Mg3Si2O5(OH)4	*
25	45-1451	9.31	0.29	3	-24	NaAl11O17	
26	39-0050	8.94	0.29	2	-76	K1.5Al11O17.25	

Analyzed DI file : C:\APD\USER\PCC\PCC-ME-2.DI
 Sample identification: PCC-M EUGENIA-2
 First database used : C:\IDENT\IDENTDB
 Second database used : C:\IDENT\EXAMPLDB
 Restrictions file : MEGB.RES

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Results:

	Card. ident.	Match score	Rel m score	I [%]	Displ [m]	Name	
1	05-0490	18.54	0.74	50	-18	Quartz, low	*
2	33-1161	18.37	0.73	48	-51	Quartz, syn	*
3	14-0172	2.87	0.72	11	-14	Neotocite	*
4	29-0704	3.96	0.57	13	37	Baumite-1T [NR]	*
5	06-0221	10.67	0.46	10	-36	Kaolinite 1Md	*
6	29-0041	17.49	0.45	30	12	Gibbsite	*
7	07-0324	17.67	0.44	16	-4	Gibbsite	
8	33-0018	19.36	0.41	10	-3	Gibbsite, syn	
9	14-0614	8.23	0.41	5	-104	Manganoan nsutite	
10	10-0430	15.81	0.41	1	-122	Dickite	
11	10-0446	15.30	0.39	2	-79	Dickite-2M1	
12	43-1456	10.11	0.37	6	-132	Birnessite, syn	
13	14-0164	24.62	0.37	3	-36	Kaolinite-1A	
14	34-0170	23.66	0.33	15	8	Nacrite-2M2	
15	44-1496	20.49	0.33	4	62	low-carnegieite	
16	42-1335	7.91	0.33	2	-117	Baileychlore-1MIb	
17	16-0606	23.38	0.33	10	-14	Nacrite-2M2	
18	13-0534	5.92	0.33	5	-22	Hematite, syn	*
19	11-0386	6.89	0.33	2	-122	Lizardite-1T, aluminian, syn	
20	31-0782	11.46	0.33	3	-145	Lizardite-6(3)T, aluminian	
21	38-0758	9.64	0.32	2	-46	Aluminum Hydride	
22	13-0002	16.80	0.32	2	62	Nacrite	
23	29-1410	10.52	0.31	1	-47	Chantalite	
24	22-1163	12.87	0.31	10	-3	Clinochrysotile, syn	*
25	45-1451	9.31	0.29	3	-24	Diaoyudaoite	
26	39-0050	8.94	0.29	2	-76	Potassium Aluminum Oxide	

analyzed DI file : C:\APD\USER\PCC\PCC-ME-3.DI
 Sample identification: PCC-M EUGENIA-3
 First database used : C:\IDENT\IDENTDB
 Second database used : C:\IDENT\EXAMPLDB
 Restrictions file : MEGB.RES

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Results:

Card Id	Match score	Rel m score	I [%]	Displ [m]	Formula		
1	33-1161	19.18	0.77	58	-79	SiO2	
2	05-0490	18.73	0.75	28	-51	SiO2	
3	14-0164	25.45	0.38	1	-104	Al2Si2O5(OH)4	*
4	16-0606	25.00	0.35	5	-122	Al2Si2O5(OH)4	
5	33-0018	20.19	0.43	2	-23	Al(OH)3	
6	34-0170	24.13	0.34	3	-97	Al2Si2O5(OH)4	
7	07-0324	17.63	0.44	11	-14	Al(OH)3	*
8	29-0041	17.33	0.44	8	12	Al(OH)3	
9	45-1446	25.56	0.30	1	-59	Ca2(Al,Fe)3(Si2O7)(SiO4)(
10	20-0452	21.24	0.35	4	-37	CaAl2Si2O8!4H2O	
11	14-0344	19.79	0.34	1	-125	FeAl2SiO5(OH)2	
12	34-0189	21.48	0.31	1	-39	Mg2SiO4	
13	44-1496	19.98	0.32	1	-24	NaAlSiO4	
14	13-0002	18.39	0.35	1	-64	Al2Si2O5(OH)4	
15	06-0221	11.69	0.51	5	-104	Al2Si2O5(OH)4	*
16	43-1399	20.03	0.29	4	73	CaMgSi	
17	10-0430	14.74	0.38	5	-150	Al2Si2O5(OH)4	
18	29-0379	17.58	0.28	2	-23	Ca6Si6O17(OH)2	
19	20-1390	15.82	0.29	1	-29	NaCa(Mg,Fe,Mn,Al)5Si8O22(
20	30-0226	12.34	0.37	2	17	Ca2(Al,Fe)2O5	
21	10-0446	13.31	0.34	1	-137	Al2Si2O5(OH)4	
22	42-0960	15.61	0.28	2	-92	Ca6.67Zn20.26	
23	08-0206	16.15	0.27	1	111	MgZn	
24	25-0843	11.85	0.37	2	-99	Mg3Fe2(SiO4)3	
25	12-0187	14.00	0.31	1	25	NaAl2(AlSi3)O10(OH)2	
26	19-1177	11.63	0.36	1	-97	NaAlO2	
27	22-1163	13.21	0.31	8	136	Mg3Si2O5(OH)4	*
28	25-0617	13.34	0.31	1	-76	KAl11O17	
29	31-0960	13.34	0.31	1	-76	K2Al22O34	
30	30-1194	14.38	0.28	1	-39	NaOH!H2O	

analyzed DI file : C:\APD\USER\PCC\PCC-ME-3.DI
 Sample identification: PCC-M EUGENIA-3
 First database used : C:\IDENT\IDENTDB
 Second database used : C:\IDENT\EXAMPLDB
 Restrictions file : MEGB.RES

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Results:

Card. ident.	Match score	Rel m score	I [%]	Displ [m]	Name		
1	33-1161	19.18	0.77	58	-79	Quartz, syn	
2	05-0490	18.73	0.75	28	-51	Quartz, low	
3	14-0164	25.45	0.38	1	-104	Kaolinite-1A	*
4	16-0606	25.00	0.35	5	-122	Nacrite-2M2	
5	33-0018	20.19	0.43	2	-23	Gibbsite, syn	
6	34-0170	24.13	0.34	3	-97	Nacrite-2M2	
7	07-0324	17.63	0.44	11	-14	Gibbsite	
8	29-0041	17.33	0.44	8	12	Gibbsite	*
9	45-1446	25.56	0.30	1	-59	Epidote	
10	20-0452	21.24	0.35	4	-37	Gismondine	
11	14-0344	19.79	0.34	1	-125	Chloritoid-A	
12	34-0189	21.48	0.31	1	-39	Forsterite, syn	
13	44-1496	19.98	0.32	1	-24	low-carnegieite	
14	13-0002	18.39	0.35	1	-64	Nacrite	
15	06-0221	11.69	0.51	5	-104	Kaolinite 1Md	
16	43-1399	20.03	0.29	4	73	Calcium Magnesium Silicon	*
17	10-0430	14.74	0.38	5	-150	Dickite	
18	29-0379	17.58	0.28	2	-23	Xonotlite	
19	20-1390	15.82	0.29	1	-29	Winchite	
20	30-0226	12.34	0.37	2	17	Brownmillerite, syn	
21	10-0446	13.31	0.34	1	-137	Dickite-2M1	
22	42-0960	15.61	0.28	2	-92	Calcium Zinc	
23	08-0206	16.15	0.27	1	111	Magnesium Zinc	
24	25-0843	11.85	0.37	2	-99	Majorite	
25	12-0187	14.00	0.31	1	25	Paragonite-2M1	
26	19-1177	11.63	0.36	1	-97	Sodium Aluminum Oxide	
27	22-1163	13.21	0.31	8	136	Clinochrysoile, syn	*
28	25-0617	13.34	0.31	1	-76	Potassium Aluminum Oxide	
29	31-0960	13.34	0.31	1	-76	Potassium Aluminum Oxide	
30	30-1194	14.38	0.28	1	-39	Sodium Hydroxide Hydrate	

*****LABORATÓRIO DE CARACTERIZAÇÃO TECNOLÓGICA - ESCOLA POLITÉCNICA DA USP*****

JOB.689 of 22-Nov-96

Today 22-Nov-96

PW 2400

Sample ident = BRANCO CPL/TOPO

Further info = PG- Civil

Calculated as : Oxides

X-ray path = Vacuum Film type = No supporting film

KnownConc = 0 %

Rest = 0 %

Dil/Sample = 0.100 WAX

Viewed Mass = 18000.00 mg

< means that the concentration is < 10 ppm

<2e means wt% < 2 StdErr. The + in Z+El means involved in Sum=100%

Z	wt%	StdErr	Z	wt%	StdErr	Z	wt%	StdErr
SumBe..F	0	0.075	29+CuO	0.020	0.002	51 Sb2O3	<	
11+Na2O	0.15	0.01	30+ZnO	0.031	0.003	52 TeO2	<	
12+MgO	<		31+Ga2O3	0.012	0.002	53 I	<2e	0.004
13+Al2O3	54.2	0.2	32 GeO2	<		55 Cs2O	<2e	0.005
14+SiO2	30.7	0.2	33 As2O3	<2e	0.006	56+BaO	<2e	0.007
15+P2O5	0.093	0.007	34 SeO2	<		SumLa..Lu	0.048	0.057
16+S	0.20	0.01	35+Br	0.0014	0.0006	72 HfO2	<2e	0.004
16+SO3	0.15	0.05	37 Rb2O	<		73 Ta2O5	<	
17+Cl	0.079	0.006	38 SrO	<		74 WO3	<	
18 Ar	<		39+Y2O3	0.0025	0.0008	75 Re2O7	<	
19+K2O	0.20	0.01	40+ZrO2	0.075	0.006	76 OsO4	<2e	0.003
20+CaO	0.111	0.009	41+Nb2O5	0.006	0.001	77 IrO2	<	
21 Sc2O3	<2e	0.002	42 MoO3	<		78 PtO2	<	
22+TiO2	2.10	0.07	44 RuO4	<		79 Au	<2e	0.002
23+V2O5	0.087	0.007	45 Rh	<		80 Hg	<	
24+Cr2O3	0.032	0.003	46 PdO	<		81 Tl2O3	<	
25+MnO	0.103	0.008	47+Ag2O	0.003	0.002	82 PbO	<	
26+Fe2O3	11.5	0.2	48 CdO	<		83 Bi2O3	<2e	0.002
27+Co3O4	0.008	0.002	49+In2O3	<2e	0.002	90 ThO2	<2e	0.004
28+NiO	0.078	0.006	50 SnO2	<		92 U3O8	<	

Light Elements			Noble Elements			Lanthanides		
4 BeO			44 RuO4	<		57+La2O3	0.016	0.003
5 B2O3			45 Rh	<		58 CeO2	<2e	0.007
6 CO2			46 PdO	<		59 Pr6O11	<2e	0.008
7 N			47+Ag2O	0.003	0.002	60 Nd2O3	<2e	0.004
8 O			75 Re2O7	<		62 Sm2O3	<	
9 F	<		76 OsO4	<2e	0.003	63 Eu2O3	<	
			77 IrO2	<		64 Gd2O3	<	
			78 PtO2	<		65+Tb4O7	<	
			79 Au	<2e	0.002	66 Dy2O3	<	
						67 Ho2O3	<	
						68+Er2O3	0.019	0.004
						69 Tm2O3	<	
						70 Yb2O3	<	
						71 Lu2O3	<	

Sum Conc's before normalisation to 100% : 39.5 %

*****LABORATÓRIO DE CARACTERIZAÇÃO TECNOLÓGICA - ESCOLA POLITÉCNICA DA USP*****

JOB.687 of 22-Nov-96

Today 22-Nov-96

PW 2400

Sample ident = CP21/TOPO ED6

Further info = PG- Civil

Calculated as : Oxides

X-ray path = Vacuum Film type = No supporting film

KnownConc = 0 %

Rest = 0 %

Dil/Sample = 0.100 WAX

Viewed Mass = 18000.00 mg

< means that the concentration is < 10 ppm

<2e means wt% < 2 StdErr. The + in Z+El means involved in Sum=100%

Z	wt%	StdErr	Z	wt%	StdErr	Z	wt%	StdErr
SumBe..F	0	0.036	29 CuO	<2e	0.001	51 Sb2O3	<	
11 Na2O	<		30+ZnO	0.021	0.002	52 TeO2	<	
12+MgO	<		31+Ga2O3	0.007	0.001	53+I	<2e	0.004
13+Al2O3	47.1	0.2	32 GeO2	<		55+Cs2O	<2e	0.005
14+SiO2	36.6	0.2	33 As2O3	<		56+BaO	0.017	0.007
15+P2O5	0.067	0.006	34 SeO2	<		SumLa..Lu	0.043	0.049
16+S	0.073	0.006	35+Br	0.0014	0.0005	72 HfO2	<	
16+SO3	0.038	0.017	37 Rb2O	<		73 Ta2O5	<	
17 Cl	<		38+SrO	<2e	0.0008	74 WO3	<	
18 Ar	<		39+Y2O3	0.0034	0.0008	75 Re2O7	<	
19+K2O	0.17	0.01	40+ZrO2	0.088	0.007	76 OsO4	<	
20+CaO	0.086	0.007	41+Nb2O5	0.006	0.001	77 IrO2	<	
21+Sc2O3	0.003	0.001	42 MoO3	<		78 PtO2	<	
22+TiO2	2.24	0.07	44 RuO4	<		79 Au	<2e	0.001
23+V2O5	0.091	0.007	45 Rh	<		80 Hg	<	
24+Cr2O3	0.022	0.002	46 PdO	<		81 Tl2O3	<	
25+MnO	0.027	0.002	47 Ag2O	<2e	0.002	82 PbO	<	
26+Fe2O3	13.3	0.2	48 CdO	<		83 Bi2O3	<	
27+Co3O4	0.008	0.002	49 In2O3	<		90 ThO2	<2e	0.003
28 NiO	<		50 SnO2	<		92 U3O8	<	

Light Elements		Noble Elements		Lanthanides	
4 BeO		44 RuO4	<	57+La2O3	0.012 0.002
5 B2O3		45 Rh	<	58 CeO2	<2e 0.005
6 CO2		46 PdO	<	59 Pr6O11	<
7 N		47 Ag2O	<2e 0.002	60 Nd2O3	<
8 O		75 Re2O7	<	62 Sm2O3	<
9 F	<	76 OsO4	<	63 Eu2O3	<
		77 IrO2	<	64 Gd2O3	<
		78 PtO2	<	65+Tb4O7	<2e 0.007
		79 Au	<2e 0.001	66 Dy2O3	<
				67 Ho2O3	<
				68+Er2O3	0.004 0.004
				69 Tm2O3	<
				70 Yb2O3	<
				71 Lu2O3	<

Sum Conc's before normalisation to 100% : 71.9 %

*****LABORATÓRIO DE CARACTERIZAÇÃO TECNOLÓGICA - ESCOLA POLITÉCNICA DA USP*****

JOB.688 of 22-Nov-96

Today 22-Nov-96

FW 2400

Sample ident = CP21/C2 ED6

Further info = PG- Civil

Calculated as : Oxides

X-ray path = Vacuum Film type = No supporting film

KnownConc = 0 %

Rest = 0 %

Dil/Sample = 0.100 WAX

Viewed Mass = 18000.00 mg

< means that the concentration is < 10 ppm

<2e means wt% < 2 StdErr. The + in Z+El means involved in Sum=100%

Z	wt%	StdErr	Z	wt%	StdErr	Z	wt%	StdErr
SumBe..F	0	0.044	29 CuO	<		51 Sb2O3	<	
11 Na2O	<		30+ZnO	0.019	0.002	52 TeO2	<	
12+MgO	<		31+Ga2O3	0.008	0.001	53 I	<	
13+Al2O3	47.5	0.2	32 GeO2	<2e	0.0010	55 Cs2O	<2e	0.005
14+SiO2	36.4	0.2	33 As2O3	<		56+BaO	<2e	0.007
15+P2O5	0.068	0.006	34 SeO2	<		SumLa..Lu	0.048	0.048
16+S	0.074	0.006	35+Br	0.0018	0.0005	72 HfO2	<2e	0.003
16+SO3	0.041	0.018	37 Rb2O	<		73 Ta2O5	<	
17 Cl	<		38 SrO	<		74 WO3	<	
18 Ar	<		39+Y2O3	0.0034	0.0008	75 Re2O7	<	
19+K2O	0.16	0.01	40+ZrO2	0.091	0.007	76 OsO4	<	
20+CaO	0.083	0.007	41+Nb2O5	0.005	0.001	77 IrO2	<	
21+Sc2O3	0.003	0.001	42+MoO3	0.004	0.002	78 PtO2	<	
22+TiO2	2.21	0.07	44 RuO4	<2e	0.002	79 Au	<2e	0.001
23+V2O5	0.095	0.008	45 Rh	<		80 Hg	<	
24+Cr2O3	0.019	0.002	46 PdO	<		81 Tl2O3	<	
25+MnO	0.019	0.002	47 Ag2O	<2e	0.001	82 PbO	<	
26+Fe2O3	13.2	0.2	48 CdO	<		83 Bi2O3	<	
27+Co3O4	0.008	0.002	49 In2O3	<		90 ThO2	<2e	0.003
28 NiO	<		50 SnO2	<		92 U3O8	<	
===== Light Elements =====			===== Noble Elements =====			===== Lanthanides =====		
4 BeO			44 RuO4	<2e	0.002	57+La2O3	0.012	0.002
5 B2O3			45 Rh	<		58 CeO2	<2e	0.005
6 CO2			46 PdO	<		59 Pr6O11	<2e	0.006
7 N			47 Ag2O	<2e	0.001	60 Nd2O3	<2e	0.003
8 O			75 Re2O7	<		62 Sm2O3	<	
9 F	<		76 OsO4	<		63 Eu2O3	<	
			77 IrO2	<		64 Gd2O3	<	
			78 PtO2	<		65+Tb4O7	<	
			79 Au	<2e	0.001	66 Dy2O3	<	
						67 Ho2O3	<	
						68+Er2O3	0.029	0.004
						69 Tm2O3	<	
						70 Yb2O3	<	
						71 Lu2O3	<	

Sum Conc's before normalisation to 100% : 72.5 %

*****LABORATÓRIO DE CARACTERIZAÇÃO TECNOLÓGICA - ESCOLA POLITÉCNICA DA USP*****

JOB.686 of 22-Nov-96

Today 22-Nov-96

PW 2400

Sample ident = CP20-C1

Further info = PG- Civil

Calculated as : Oxides

X-ray path = Vacuum Film type = No supporting film

KnownConc = 0 %

Rest = 0 %

Dil/Sample = 0.100 WAX

Viewed Mass = 18000.00 mg

< means that the concentration is < 10 ppm

<2e means wt% < 2 StdErr. The + in Z+El means involved in Sum=100%

Z	wt%	StdErr	Z	wt%	StdErr	Z	wt%	StdErr
SumBe..F	0	0.048	29 CuO	<2e	0.001	51 Sb2O3	<	
11 Na2O	<		30+ZnO	0.013	0.001	52 TeO2	<	
12+MgO	<		31+Ga2O3	0.007	0.001	53+I	<2e	0.004
13+Al2O3	46.9	0.2	32 GeO2	<		55+Cs2O	<2e	0.005
14+SiO2	36.3	0.2	33 As2O3	<2e	0.006	56+BaO	0.016	0.008
15+P2O5	0.077	0.006	34 SeO2	<		SumLa..Lu	0.049	0.049
16+S	0.22	0.02	35+Br	0.0017	0.0005	72 HfO2	<	
16+S03	0.11	0.05	37 Rb2O	<		73 Ta2O5	<	
17 Cl	<		38 SrO	<		74 WO3	<	
18 Ar	<		39+Y2O3	0.0030	0.0008	75 Re2O7	<	
19+K2O	0.17	0.01	40+ZrO2	0.091	0.007	76 OsO4	<	
20+CaO	0.049	0.004	41+Nb2O5	0.005	0.001	77 IrO2	<	
21 Sc2O3	0.002	0.001	42 MoO3	<		78 PtO2	<	
22+TiO2	2.24	0.07	44 RuO4	<		79 Au	<	
23+V2O5	0.096	0.008	45 Rh	<		80 Hg	<	
24+Cr2O3	0.021	0.002	46 PdO	<		81 Tl2O3	<	
25+MnO	0.022	0.002	47+Ag2O	0.003	0.002	82 PbO	<	
26+Fe2O3	13.6	0.2	48 CdO	<		83 Bi2O3	<	
27+Co3O4	0.012	0.002	49 In2O3	<		90 ThO2	<	
28 NiO	<		50 SnO2	<		92 U3O8	<	

Light Elements			Noble Elements			Lanthanides		
4 BeO			44 RuO4	<		57+La2O3	0.013	0.002
5 B2O3			45 Rh	<		58 CeO2	<2e	0.005
6 CO2			46 PdO	<		59 Pr6O11	<2e	0.006
7 N			47+Ag2O	0.003	0.002	60 Nd2O3	<	
8 O			75 Re2O7	<		62 Sm2O3	<	
9 F	<		76 OsO4	<		63 Eu2O3	<2e	0.003
			77 IrO2	<		64 Gd2O3	<	
			78 PtO2	<		65+Tb4O7	<2e	0.007
			79 Au	<		66 Dy2O3	<	
						67 Ho2O3	<	
						68+Er2O3	0.005	0.004
						69 Tm2O3	<	
						70 Yb2O3	<	
						71 Lu2O3	<	

Sum Conc's before normalisation to 100% : 71.2 %

*****LABORATÓRIO DE CARACTERIZAÇÃO TECNOLÓGICA - ESCOLA POLITÉCNICA DA USP*****

JOB.685 of 22-Nov-96

Today 22-Nov-96

PW 2400

Sample ident = CP20-C2

Further info = PG- Civil

Calculated as : Oxides

X-ray path = Vacuum Film type = No supporting film

KnownConc = 0 %

Rest = 0 %

Dil/Sample = 0.100 WAX

Viewed Mass = 18000.00 mg

< means that the concentration is < 10 ppm

<2e means wt% < 2 StdErr. The + in Z+El means involved in Sum=100%

Z	wt%	StdErr	Z	wt%	StdErr	Z	wt%	StdErr
SumBe..F	0	0.043	29 CuO	<2e	0.001	51 Sb2O3	<	
11 Na2O	<		30+ZnO	0.0087	0.0010	52 TeO2	<	
12+MgO	<		31+Ga2O3	0.008	0.001	53 I	<2e	0.004
13+Al2O3	47.7	0.2	32 GeO2	<		55 Cs2O	<2e	0.006
14+SiO2	35.7	0.2	33 As2O3	<		56+BaO	<2e	0.008
15+P2O5	0.075	0.006	34 SeO2	<		SumLa..Lu	0.047	0.049
16+S	0.075	0.006	35+Br	0.0019	0.0005	72 HfO2	<	
16+SO3	<2e	0.018	37 Rb2O	<		73 Ta2O5	<	
17 Cl	<		38+SrO	<2e	0.0008	74 WO3	<	
18 Ar	<		39+Y2O3	0.0039	0.0008	75 Re2O7	<	
19+K2O	0.16	0.01	40+ZrO2	0.090	0.007	76 OsO4	<	
20+CaO	0.113	0.009	41+Nb2O5	0.005	0.001	77 IrO2	<	
21+Sc2O3	0.003	0.001	42 MoO3	<		78 PtO2	<	
22+TiO2	2.29	0.07	44 RuO4	<		79 Au	<	
23+V2O5	0.104	0.008	45 Rh	<		80 Hg	<	
24+Cr2O3	0.022	0.002	46 PdO	<		81 Tl2O3	<	
25+MnO	0.021	0.002	47 Ag2O	<		82 PbO	<	
26+Fe2O3	13.5	0.2	48 CdO	<		83 Bi2O3	<	
27+Co3O4	0.012	0.002	49 In2O3	<2e	0.002	90 ThO2	<2e	0.003
28 NiO	<		50 SnO2	<		92 U3O8	<	

Light Elements			Noble Elements			Lanthanides		
4 BeO			44 RuO4	<		57+La2O3	0.012	0.002
5 B2O3			45 Rh	<		58 CeO2	<2e	0.006
6 CO2			46 PdO	<		59 Pr6O11	<	
7 N			47 Ag2O	<		60 Nd2O3	<	
8 O			75 Re2O7	<		62 Sm2O3	<2e	0.003
9 F	<		76 OsO4	<		63 Eu2O3	<	
			77 IrO2	<		64 Gd2O3	<	
			78 PtO2	<		65+Tb4O7	<2e	0.007
			79 Au	<		66 Dy2O3	<	
						67 Ho2O3	<	
						68+Er2O3	0.025	0.004
						69+Tm2O3	<	
						70 Yb2O3	<	
						71 Lu2O3	<	

Sum Conc's before normalisation to 100% : 71.2 %

Tabela-resumo dos resultados dos ensaios de fluorescência de raios-X

Óxidos	Solo natural		CP20-C1		CP20-C2	
	Teor (%)	Erro-padrão	Teor (%)	Erro-padrão	Teor (%)	Erro-padrão
Be...F	0	0,075	0	0,048	0	0,043
Na ₂ O	0,15	0,01				
Al ₂ O ₃	54,2	0,2	46,9	0,2	47,7	0,2
SiO ₂	30,7	0,2	36,3	0,2	35,7	0,2
P ₂ O ₅	0,093	0,007	0,077	0,006	0,075	0,006
S	0,20	0,01	0,22	0,02	0,075	0,006
SO ₃	0,15	0,05	0,11	0,05	<2e	0,018
Cl	0,079	0,006				
K ₂ O	0,20	0,01	0,17	0,01	0,16	0,01
CaO	0,111	0,009	0,049	0,004	0,113	0,009
Sc ₂ O ₃	<2e	0,002	0,002	0,001	0,003	0,001
TiO ₂	2,10	0,07	2,24	0,07	2,29	0,07
V ₂ O ₅	0,087	0,007	0,096	0,008	0,104	0,008
Cr ₂ O ₃	0,032	0,003	0,021	0,002	0,022	0,002
MnO	0,103	0,008	0,022	0,002	0,021	0,002
Fe ₂ O ₃	11,5	0,2	13,6	0,2	13,5	0,2
Co ₃ O ₄	0,008	0,002	0,012	0,002	0,012	0,002
NiO	0,078	0,006				
CuO	0,020	0,002	<2e	0,001	<2e	0,001
ZnO	0,031	0,003	0,013	0,001	0,0087	0,0010
Ga ₂ O ₃	0,012	0,002	0,007	0,001	0,008	0,001
As ₂ O ₃	<2e	0,006	<2e	0,006		
Br	0,0014	0,0006	0,0017	0,0005	0,0019	0,0005
SrO					<2e	0,0008
Y ₂ O ₃	0,0025	0,0008	0,0030	0,0008	0,0039	0,0008
ZrO ₂	0,075	0,006	0,091	0,007	0,090	0,007
Nb ₂ O ₅	0,006	0,001	0,005	0,001	0,005	0,001
Ag ₂ O	0,003	0,002	0,003	0,002		
In ₂ O ₃	<2e	0,002			<2e	0,002
I	<2e	0,004	<2e	0,004	<2e	0,004
Cs ₂ O	<2e	0,005	<2e	0,005	<2e	0,006
BaO	<2e	0,007	0,016	0,008	<2e	0,008
La ₂ O ₃	0,016	0,003	0,013	0,002	0,012	0,002
CeO ₂	<2e	0,007	<2e	0,005	<2e	0,006
Pr ₆ O ₁₁	<2e	0,008	<2e	0,006		
Nd ₂ O ₃	<2e	0,004				
Sm ₂ O ₃					<2e	0,003
Eu ₂ O ₃			<2e	0,003		
Tb ₄ O ₇			<2e	0,007	<2e	0,007
Er ₂ O ₃	0,019	0,004	0,005	0,004	0,025	0,004
La...Lu	0,048	0,057	0,049	0,049	0,047	0,049
HfO ₂	<2e	0,004				
OsO ₄	<2e	0,003				
Au	<2e	0,002				
Bi ₂ O ₃	<2e	0,002				
ThO ₂	<2e	0,004			<2e	0,003

(*) Teor: porcentagem em massa do óxido em relação à massa total da amostra

(**) Lacuna ou ausência na tabela: teor menor do que 10 ppm

(***) <2e: teor menor do que 2 vezes o erro-padrão

Óxidos	Branco		CP21-C1		CP21-C2	
	Teor (%)	Erro-padrão	Teor (%)	Erro-padrão	Teor (%)	Erro-padrão
Be...F	0	0,075	0	0,036	0	0,044
Na ₂ O	0,15	0,01				
Al ₂ O ₃	54,2	0,2	47,1	0,2	47,5	0,2
SiO ₂	30,7	0,2	36,6	0,2	36,4	0,2
P ₂ O ₅	0,093	0,007	0,067	0,006	0,068	0,006
S	0,20	0,01	0,073	0,006	0,074	0,006
SO ₃	0,15	0,05	0,038	0,017	0,041	0,018
Cl	0,079	0,006				
K ₂ O	0,20	0,01	0,17	0,01	0,16	0,01
CaO	0,111	0,009	0,086	0,007	0,083	0,007
Sc ₂ O ₃	<2e	0,002	0,003	0,001	0,003	0,001
TiO ₂	2,10	0,07	2,24	0,07	2,21	0,07
V ₂ O ₅	0,087	0,007	0,091	0,007	0,095	0,008
Cr ₂ O ₃	0,032	0,003	0,022	0,002	0,019	0,002
MnO	0,103	0,008	0,027	0,002	0,019	0,002
Fe ₂ O ₃	11,5	0,2	13,3	0,2	13,2	0,2
Co ₃ O ₄	0,008	0,002	0,008	0,002	0,008	0,002
NiO	0,078	0,006				
CuO	0,020	0,002	<2e	0,001		
ZnO	0,031	0,003	0,021	0,002	0,019	0,002
Ga ₂ O ₃	0,012	0,002	0,007	0,001	0,008	0,001
Ge ₂ O ₃					<2e	0,0010
As ₂ O ₃	<2e	0,006				
Br	0,0014	0,0006	0,0014	0,0005	0,0018	0,0005
SrO			<2e	0,0008		
Y ₂ O ₃	0,0025	0,0008	0,0034	0,0008	0,0034	0,0008
ZrO ₂	0,075	0,006	0,088	0,007	0,091	0,007
Nb ₂ O ₅	0,006	0,001	0,006	0,001	0,005	0,001
MoO ₃					0,004	0,002
RuO ₄					<2e	0,002
Ag ₂ O	0,003	0,002	<2e	0,002	<2e	0,001
In ₂ O ₃	<2e	0,002				
I	<2e	0,004	<2e	0,004		
Cs ₂ O	<2e	0,005	<2e	0,005	<2e	0,005
BaO	<2e	0,007	0,017	0,007	<2e	0,007
La...Lu	0,048	0,057	0,043	0,049	0,048	0,048
La ₂ O ₃	0,016	0,003	0,012	0,002	0,012	0,002
CeO ₂	<2e	0,007	<2e	0,005	<2e	0,005
Pr ₆ O ₁₁	<2e	0,008			<2e	0,006
Nd ₂ O ₃	<2e	0,004			<2e	0,003
Tb ₄ O ₇			<2e	0,007		
Er ₂ O ₃	0,0019	0,004	0,004	0,004	0,029	0,004
HfO ₂	<2e	0,004			<2e	0,003
OsO ₄	<2e	0,003				
Au	<2e	0,002	<2e	0,001	<2e	0,001
Bi ₂ O ₃	<2e	0,002				
ThO ₂	<2e	0,004	<2e	0,003	<2e	0,003

(*) Teor: porcentagem em massa do óxido em relação à massa total da amostra

(**) Lacuna ou ausência na tabela: teor menor do que 10 ppm

(***) <2e: teor menor do que 2 vezes o erro-padrão

