Recuperação de PCBs em Diferentes Matrizes

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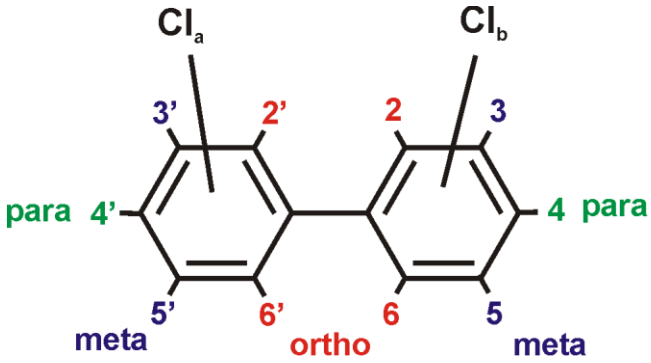
Fevereiro de 2017

PCB

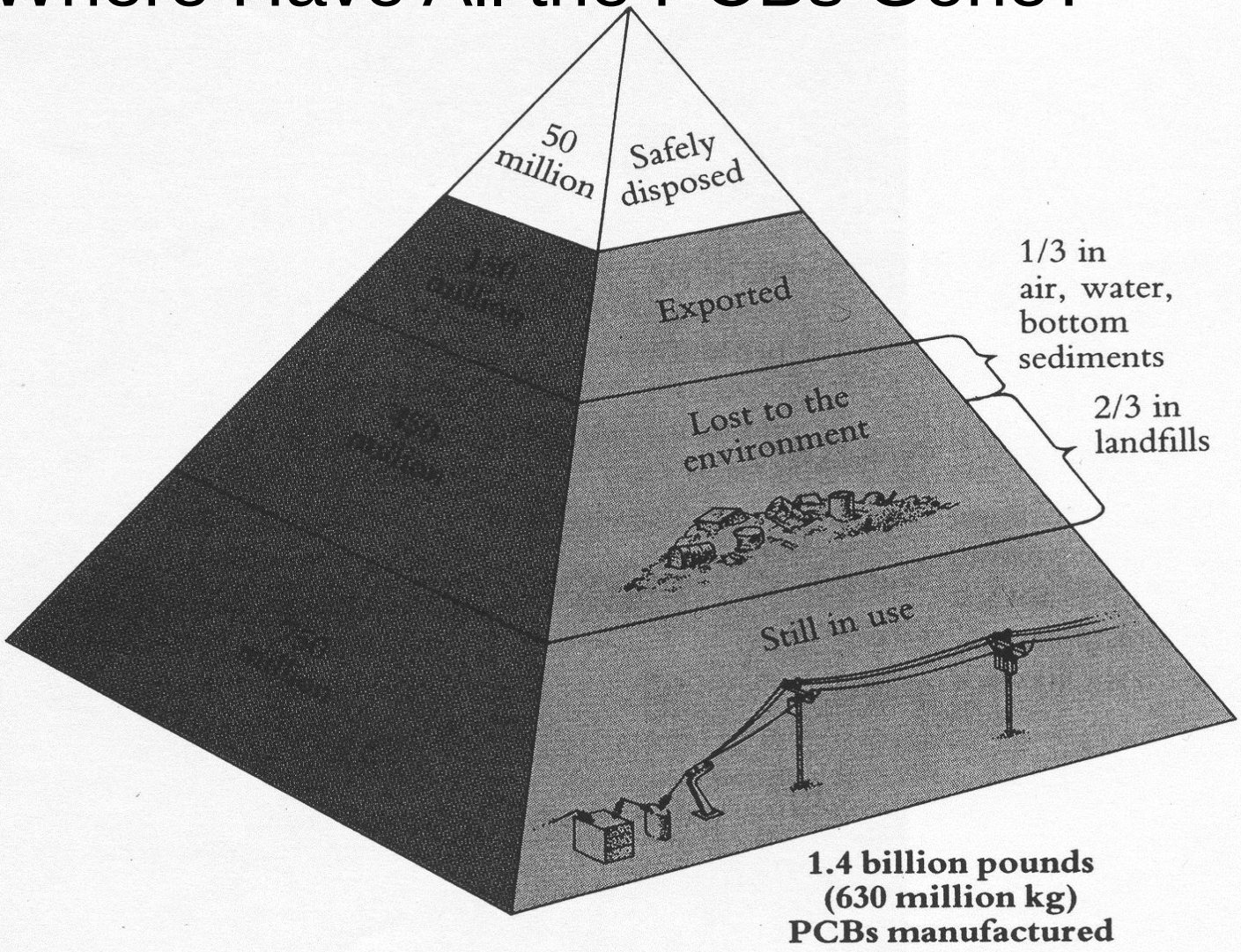
Podem existir até 209 estruturas diferentes de PCBs, denominados congêneres, mas apenas entre 50 a 130 espécies são verificadas em produtos comerciais.



$C_{12}H_{10-n}Cl_n$ n = 1 to 10

Fórmula estrutural dos PCBs

Where Have All the PCBs Gone?



Situation as of ca. 1990

Orcas and Belugas

The View from the Top of the Food Chain

Orca Life Expectancies

Males: Average 29 yrs (Max. ca. 50 yrs).

Females: Average 50 yrs (Max. 80-90 yrs).

Data: Females "lose" up to half of their net PCB load each gestation.

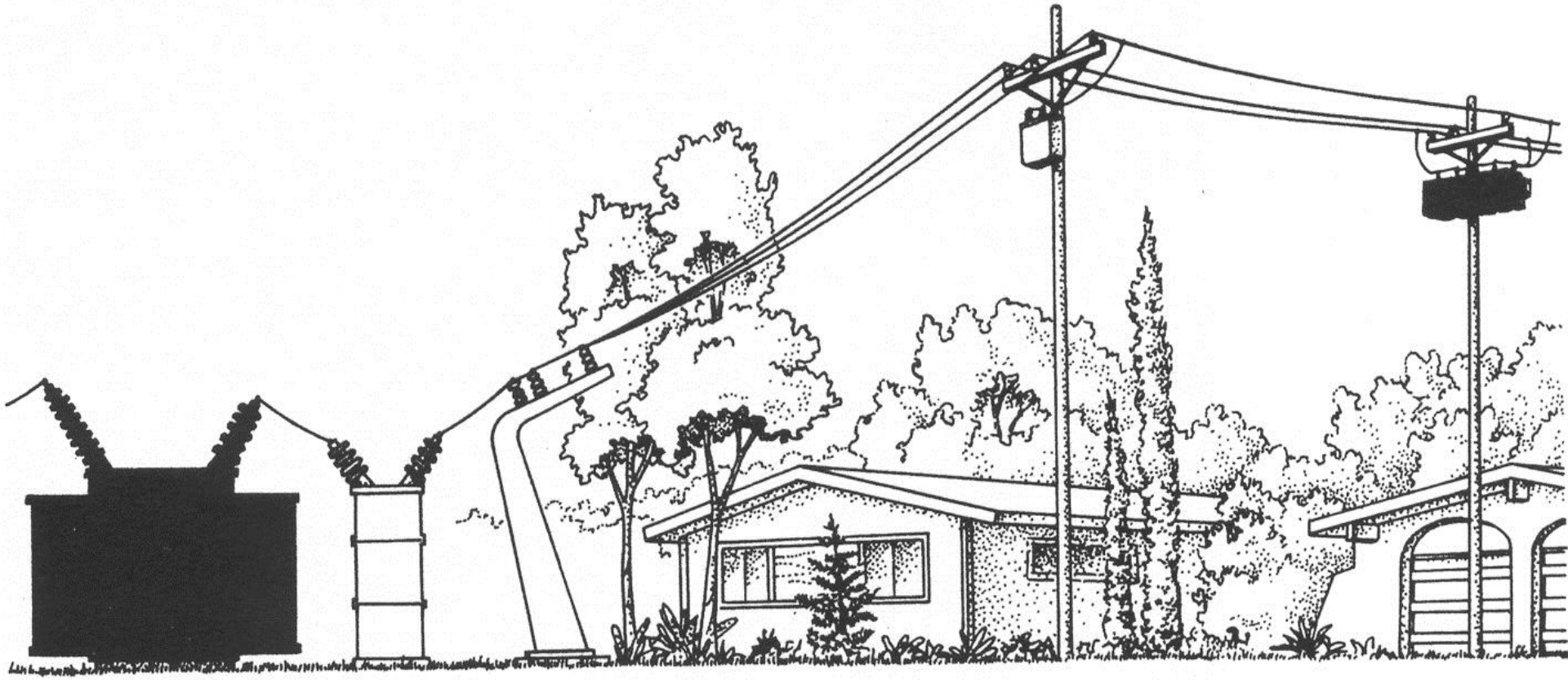
Belugas

PCB Loads as high as 1000 ppm (1g/kg) of fat.

Dead belugas classified as toxic waste.

PCBs em Equipamentos

And Some are Still in Use in Brazil!

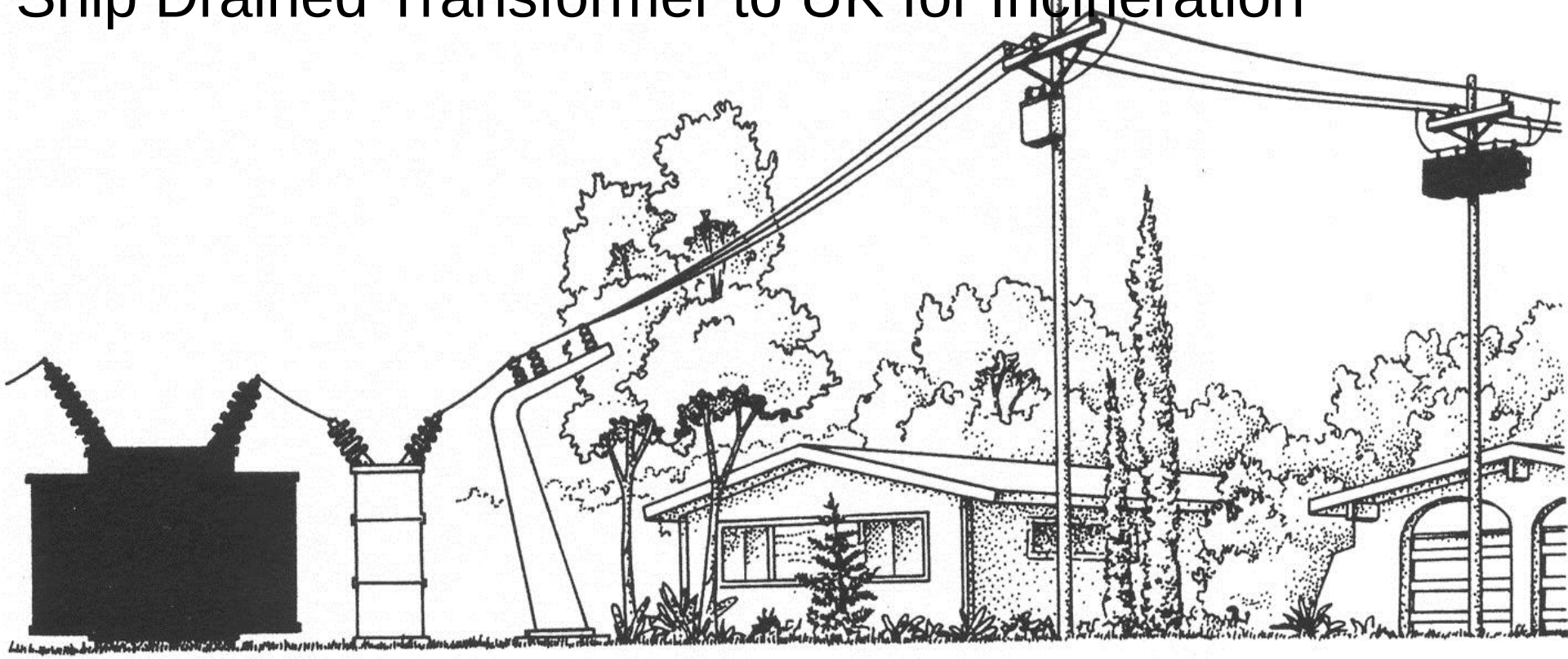


pre-1977 transformers/capacitors

Old PCB-Contaminated Transformers:

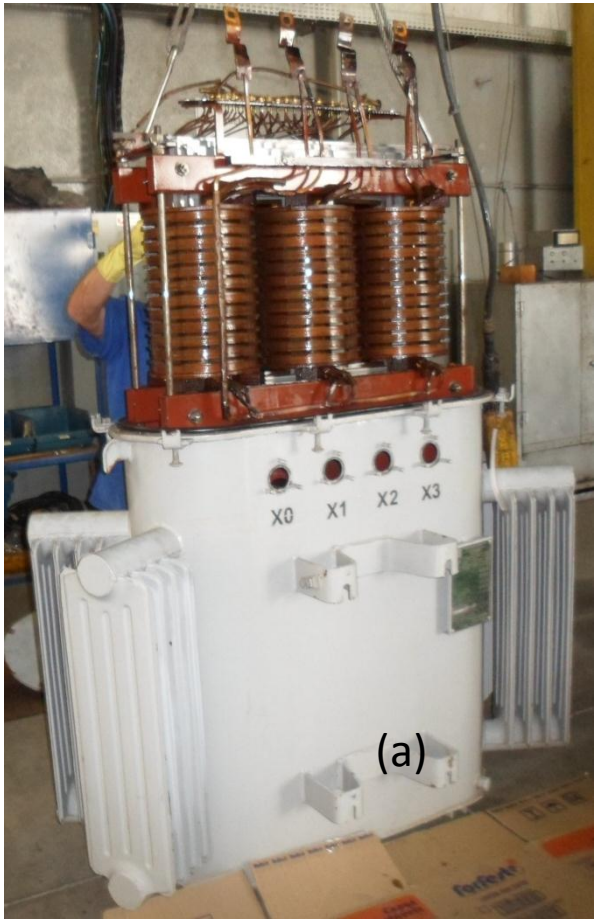
Drain the Oil, Ship to UK for Incineration (Plasma)

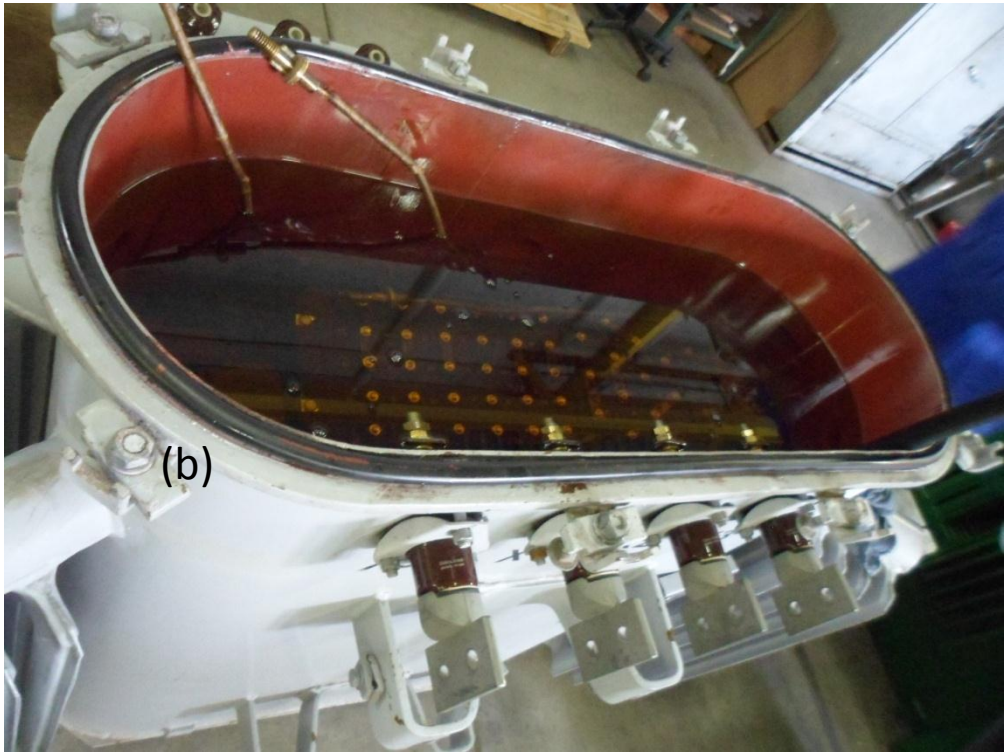
Ship Drained Transformer to UK for Incineration



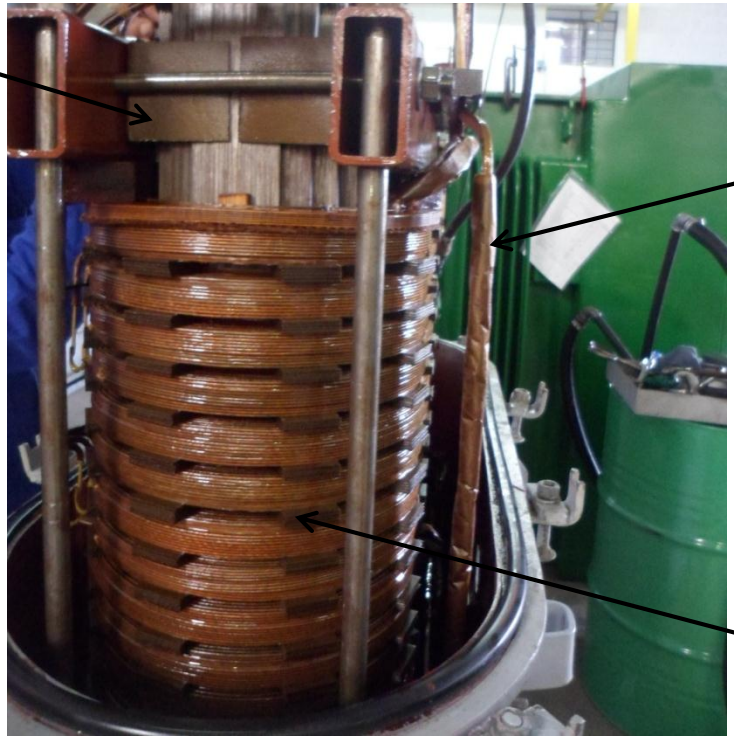
pre-1977 transformers/capacitors

Transformador elétrico





Transformador elétrico (a) vista frontal (b) vista superior com óleo isolante com 24 ppm de PCB



Transformador elétrico e os materiais sólidos permeáveis

Descontaminação de equipamentos contaminados com PCBs

Resultados obtidos com o papel de menor espessura (<0,2 mm)

Amostra	Massa da amostra seca (g)	Massa de óleo absorvida na amostra (g)	Massa da amostra seca (g)	Massa de óleo residual na amostra (g)	Rendimento da extração (%)
	ANTES DA EXTRAÇÃO		APÓS EXTRAÇÃO		
A1	0,0658	0,0572	0,0665	0,0007	98,8
A2	0,0688	0,062	0,0699	0,0011	98,2
A3	0,0636	0,066	0,0646	0,0010	98,5
B1	0,0687	0,0645	0,0690	0,0003	99,5
B2	0,0646	0,0628	0,0656	0,0010	98,4
B3	0,0670	0,069	0,0685	0,0015	97,8

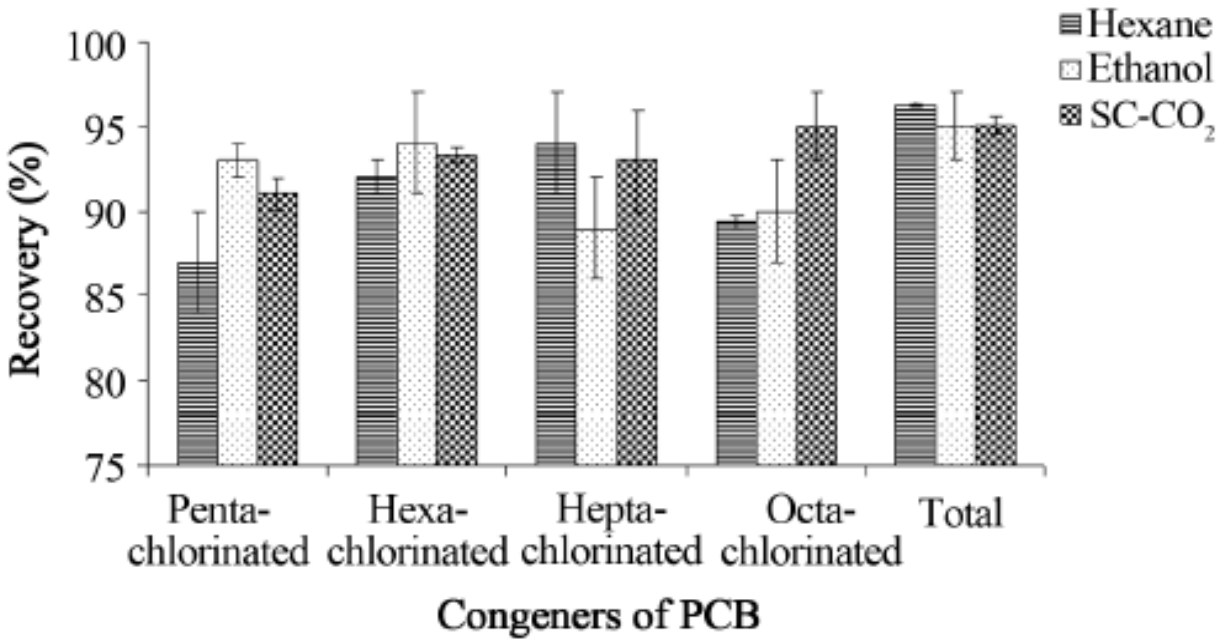


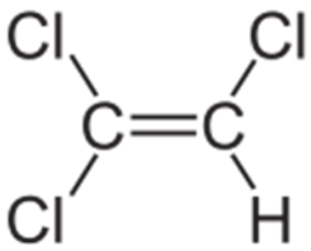
Figure 8. PCB extraction from wood contaminated with 60.000 mg PCB mixture/kg wood. PCB extraction was carried out by the Soxhlet method using hexane or ethanol as the extraction solvent, and by SFE extraction using supercritical CO_2 (70°C, 200 bar).

SILVA, D. J.; PRIETRI, F. V.; MORAES, J. E. F.; BAZITO, R. C.; PEREIRA, C. G. Treatment of Materials Contaminated with Polychlorinated Biphenyls (PCBS): Comparison of Traditional Method and Supercritical Fluid Extraction. American Journal of Analytical Chemistry, v. 03, p. 891-898, 2012.

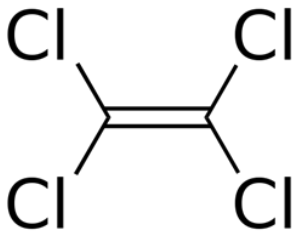
PCBs no Solo

DNAPL Types

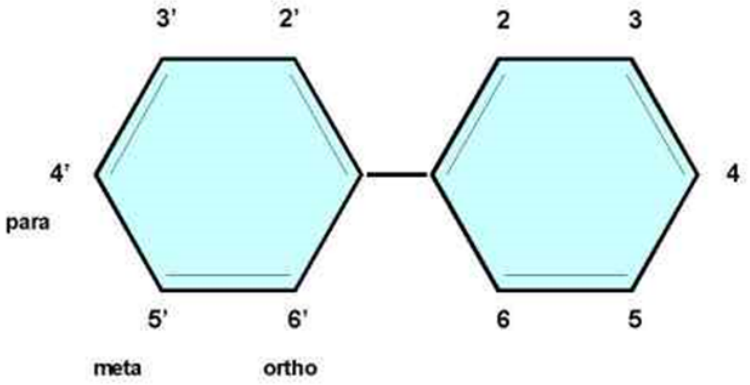
- Chlorinated solvents
- Coal tar
- Creosote
- Heavy petroleum such as some #6/Bunker fuel oil products
- Oils containing Polychlorinated biphenyls (PCBs)



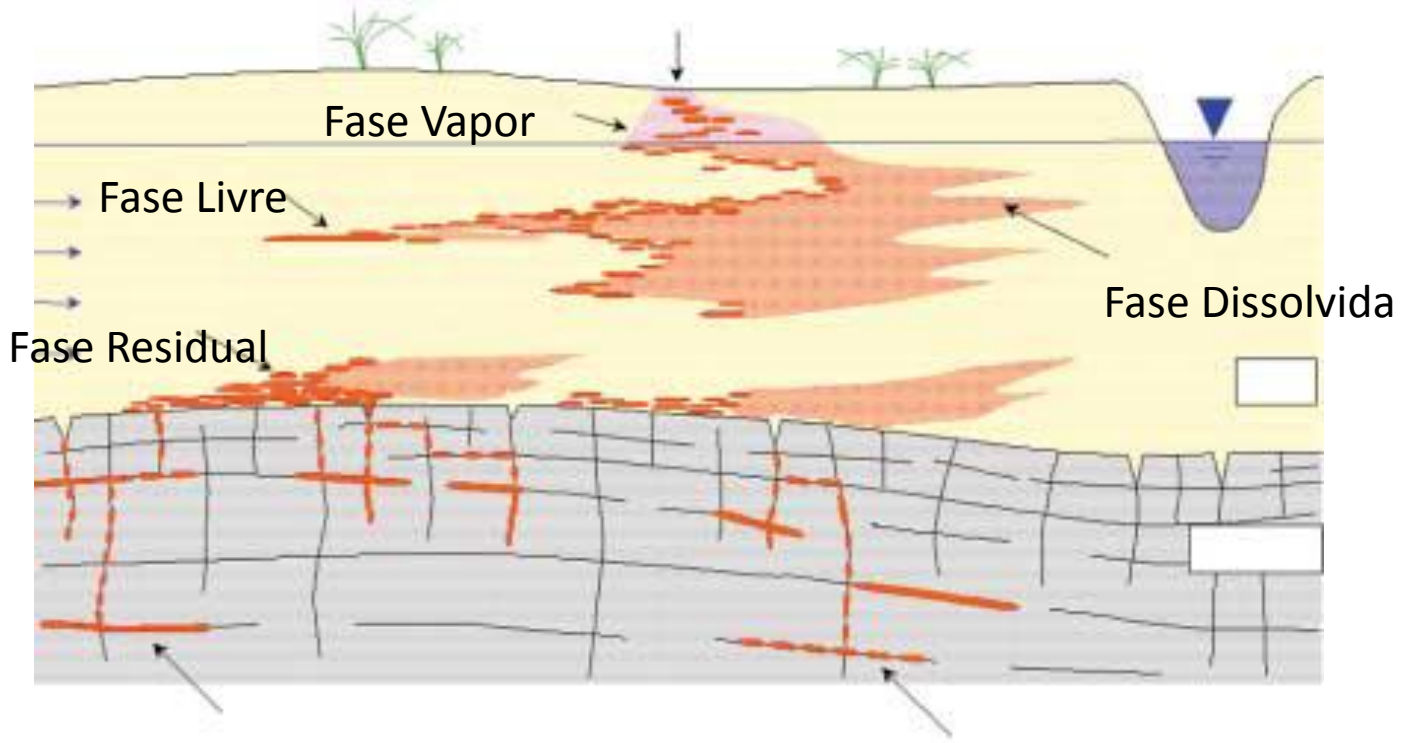
TCE (C_2HCl_3)
trichloroethene
trichloroethylene



PCE (C_2Cl_4)
Tetrachloroethene
Tetrachloroethylene
perchloroethylene (perc)



PCB
Polychlorinated biphenyl



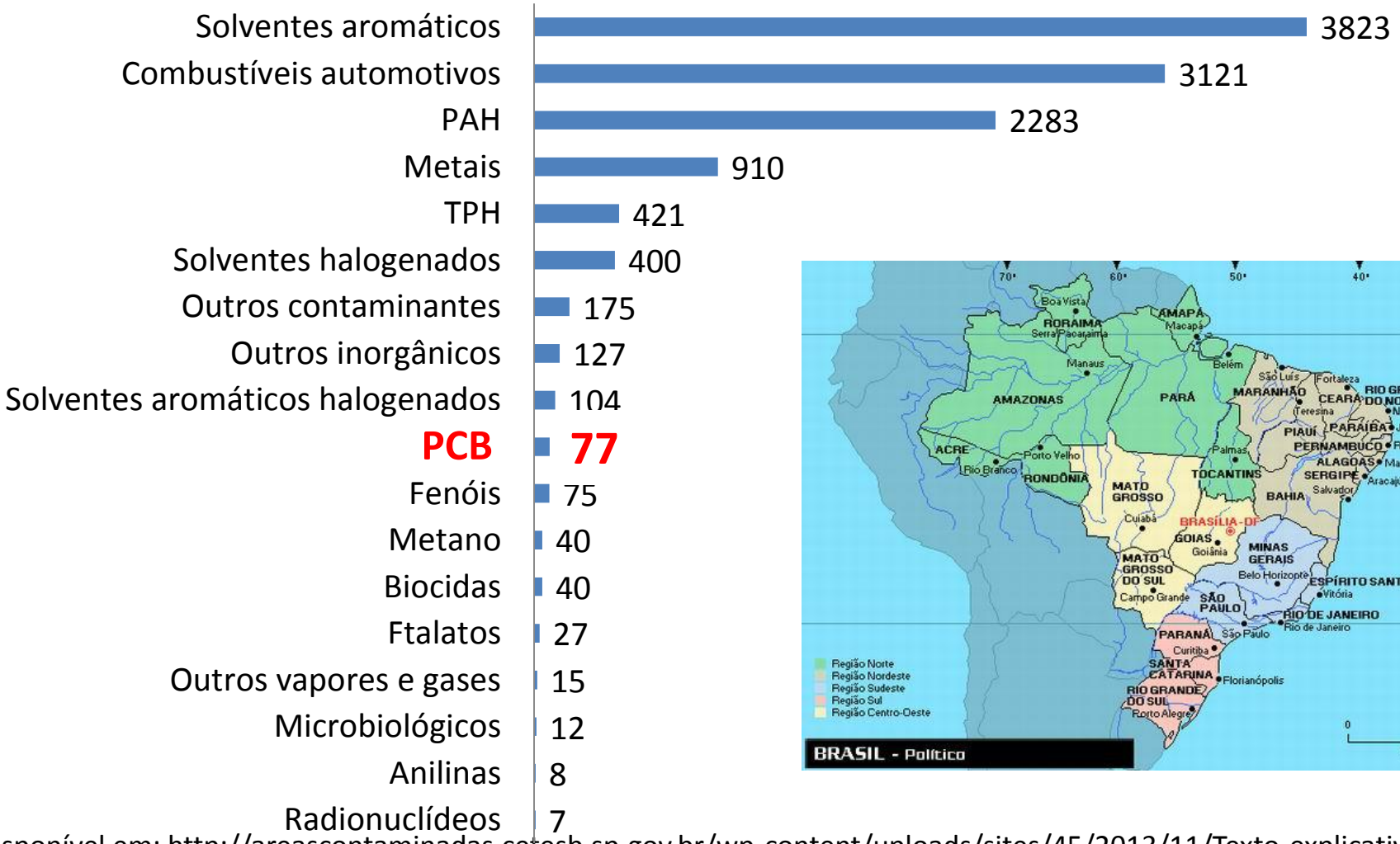
DNAPL Fase Livre nas Fraturas

DNAPL Fase Residual nas Fraturas

DNAPL distribution in unconsolidated deposits (after Pankow and Cherry, 1996) Illustrated handbook of DNAPL transport and fate in the subsurface (**Environment Agency R&D Publication 133)** ISBN : 1844320669

Grupos de Contaminantes

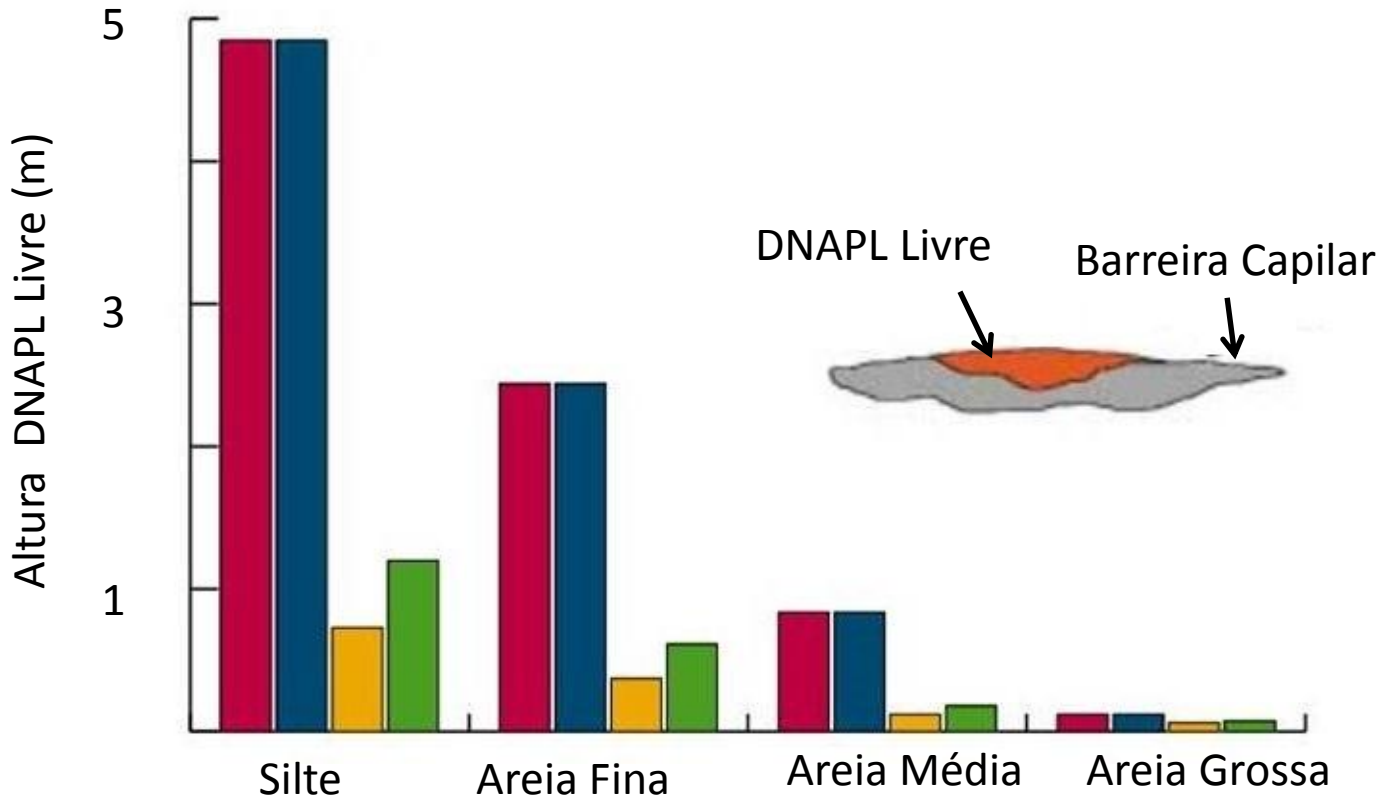
5376 áreas – Lista Cetesb Dezembro de 2015



Disponível em: http://areascontaminadas.cetesb.sp.gov.br/wp-content/uploads/sites/45/2013/11/Texto-explicativo.pdf

	Indústria	Comércio	Posto de Combustível	Resíduo	Acidentes	Desconhecido	Total
Vários Contaminantes + PCBs	39	12	1	12	3		**67**
Contaminação só com PCB	7		1		1	1	**10**
Contaminantes							
Metais	30	8	1	10	1		50
Outros inogânicos	5			3			8
Solventes halogenados	13	5		4	1		23
Solventes aromáticos	12	4		2	1		19
Solventes aromáticos halogenados	6	2		2			10
PAH	19	7		10	3		39
PCB	38	12	1	13	3		67
Metano				3			3
Combustíveis automotivos	4	4		1			9
Fenóis	5			2			7
Biocidas	3	1		1			5
Ftalatos	5	1		1			7
Dioxinas e furanos	1			1			2
TPH	13	2		1			16
Outros	4	1		1			6

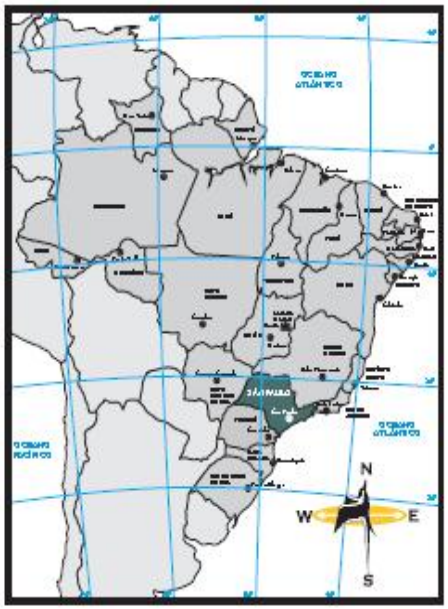
Capillary Pressure of Coarser Layers and DNAPL Entry



- Creosoto
- Coal tar
- Solventes Clorados
- Mistura de DNAPL

Kueper et. Al. 2003, An illustrated Handbook of DNAPL Transport and Fate in the Subsurface

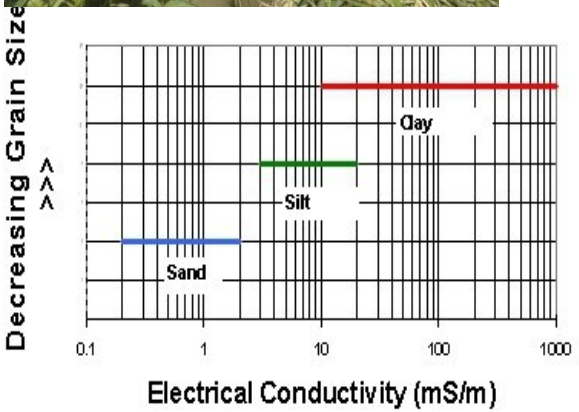
Área de Estudo



Área 101.842 m²

Metodologia TRIAD

Direct Push Condutividade Elétrica



Direct Push Injection Logging

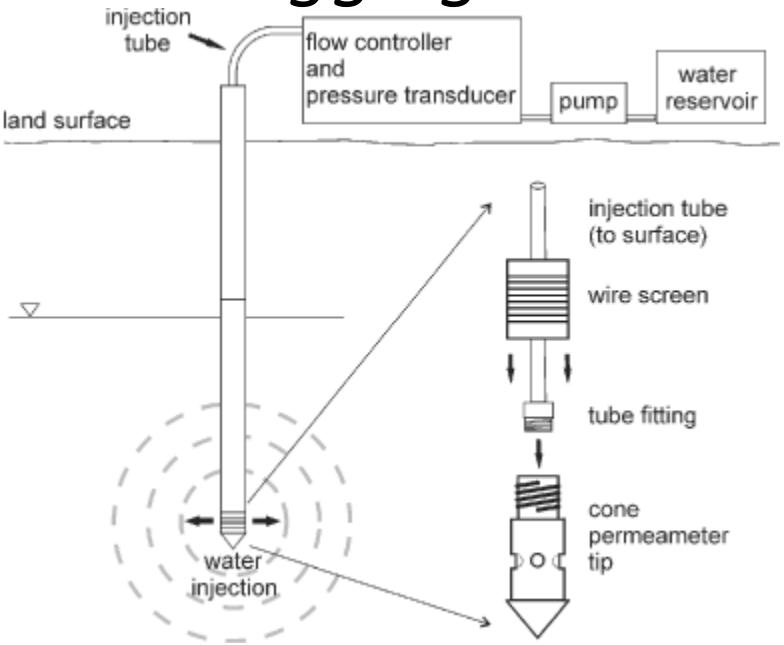
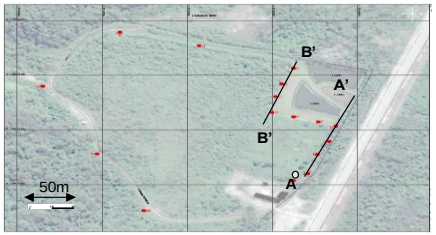


Figura 1: Esquema da ferramenta *Direct Push Injection Logger* (DPIL). Fonte: Dietrich et al. (2008).



LEGENDA:

Kr [L/(h*bar)] EC (mS/m)

Zona de Fluxo N.A (inferido)

* ESCALA HORIZONTAL ESQUEMÁTICA

PROJETO:

MODELO CONCEITUAL DA ÁREA DE ESTUDO

Contrato de Prestação de Serviços nº ADM - 122/2014

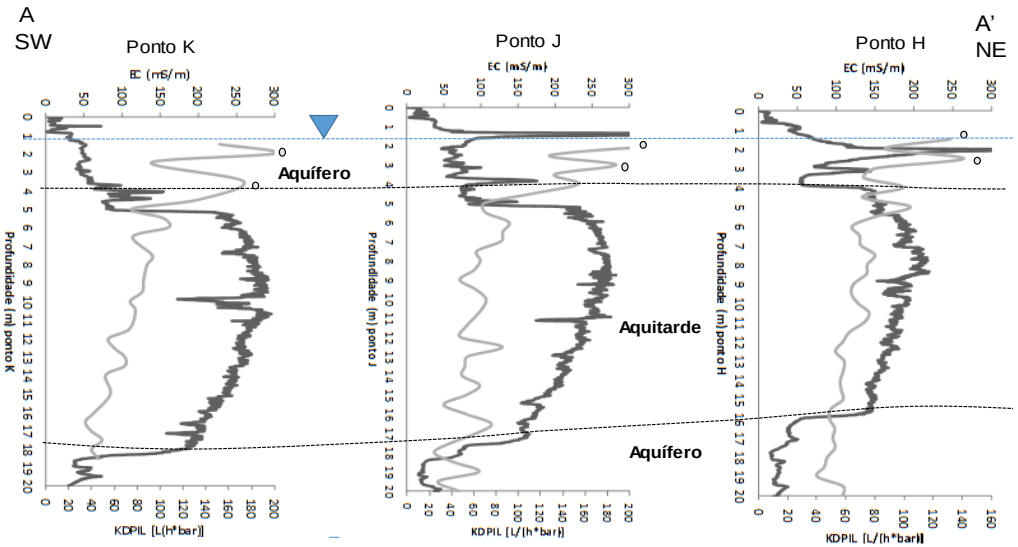
Aterro Sanitário do Município de Cubatão

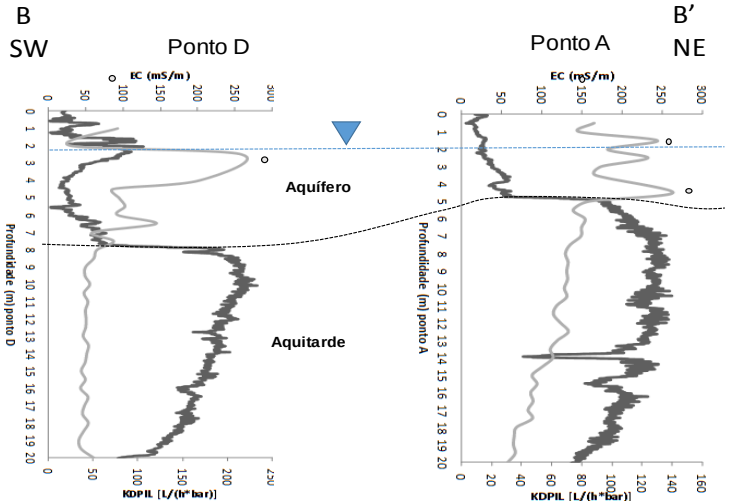
PREFEITURA MUNICIPAL DE CUBATÃO

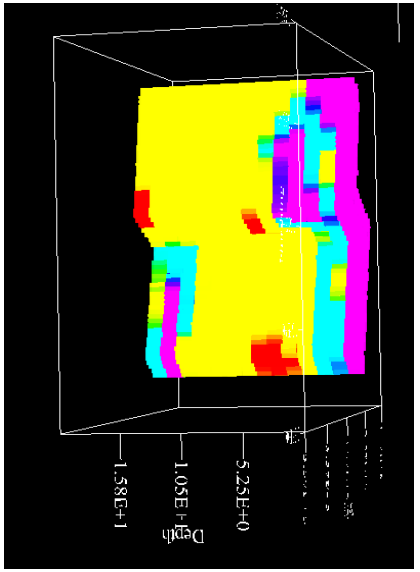
CUBATÃO – SP

CEPEMA POLI • USP

Centro de Capacitação e Pesquisa em Meio Ambiente







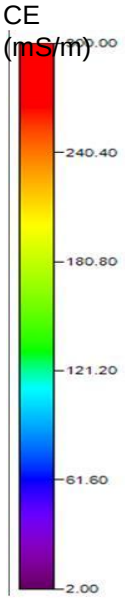


Figura: Seção Trasnversal– DPIL (Krelative: [L/(h*bar)]) com EC (mS/m) (SW-NE).

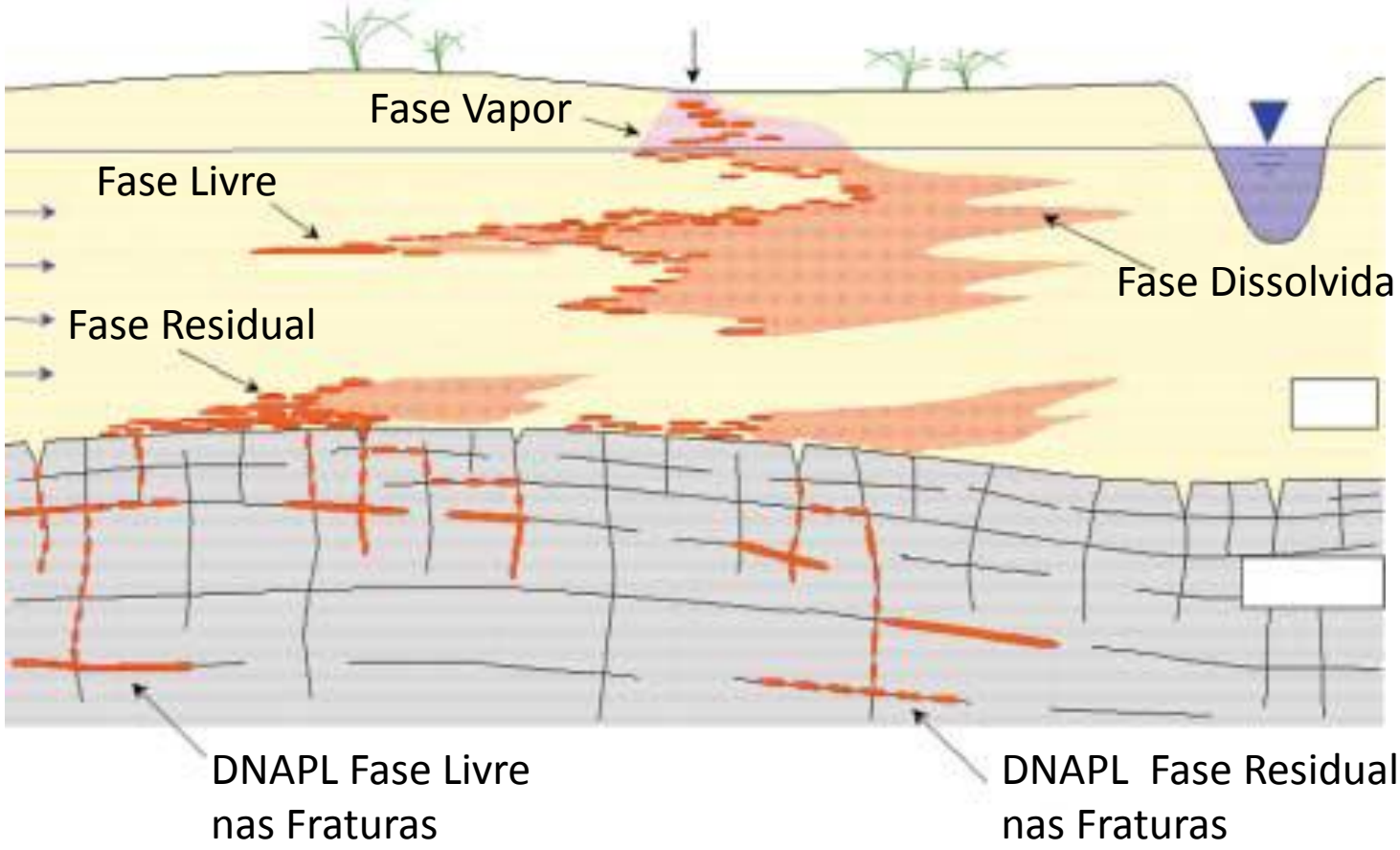
Tecnologias de Medição no Estudo em Tempo Real

Instrumentos Portáteis
GC TID/PID

Laboratório Fixo com respostas rápidas

DP Technologias:
DPEC, DPIL, DPMIP, DPHPT...

Instrumentos Portáteis
CH_4, H_2S, CO_2 e O_2



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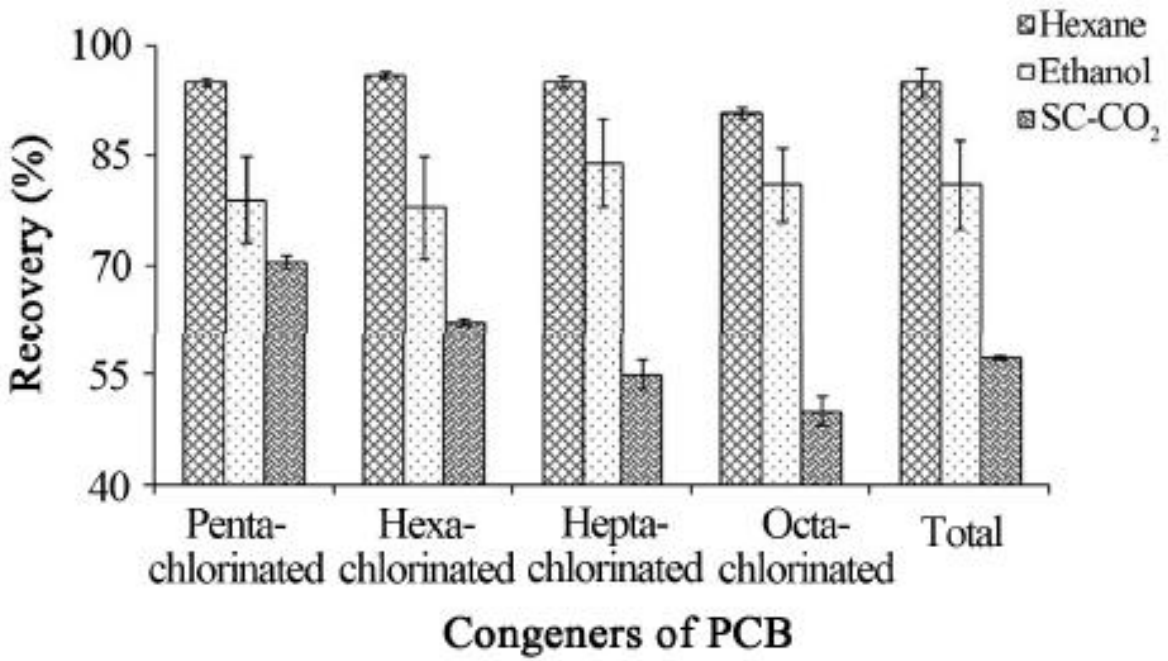

Figure 6. PCB extraction from soil contaminated with 60.000 mg PCB mixture/kg soil. PCB extraction was carried out by the Soxhlet method using hexane or ethanol as the extraction solvent, and by SFE extraction using supercritical CO_2 (70°C, 200 bar).

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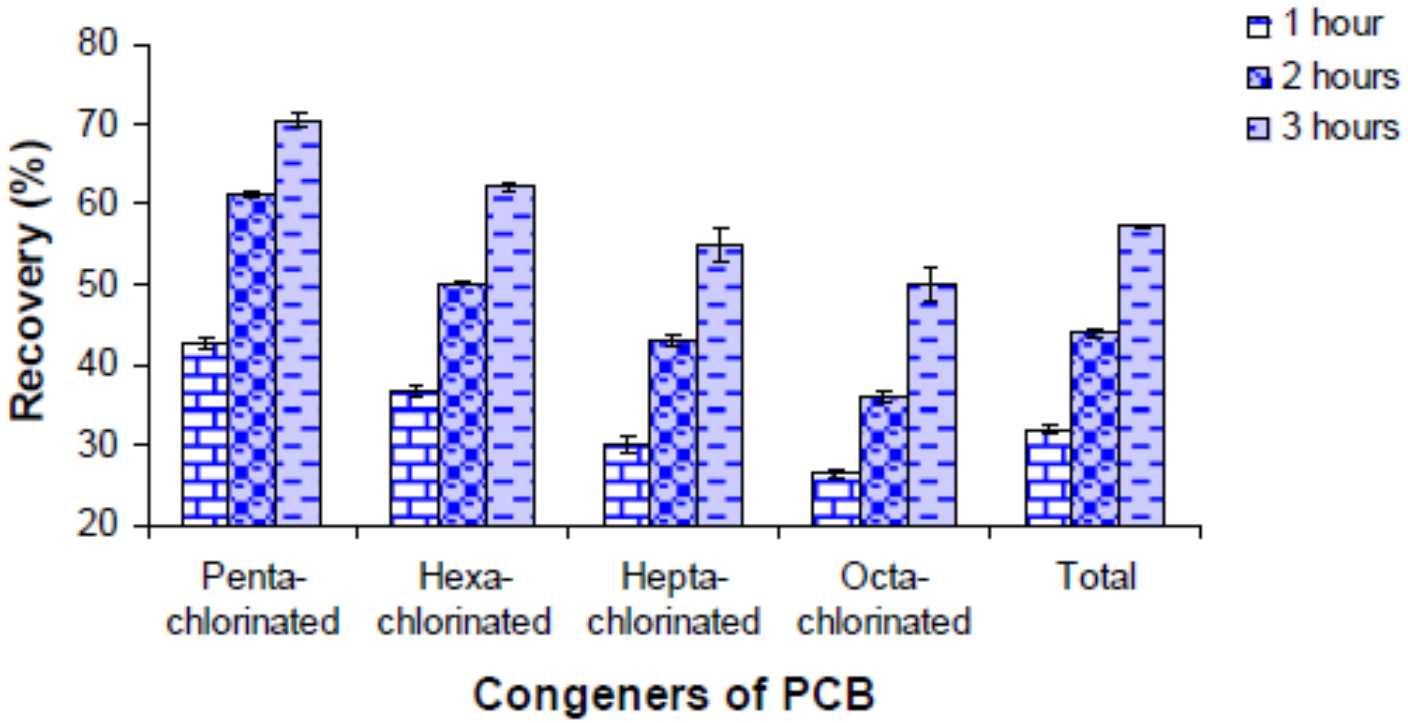

Figure 5. SFE PCB extraction from soil contaminated with 60.000 mg of PCB mixture/kg soil using SC-CO_2 (70°C, 200 bar).

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Capacitação

Identificação e Gerenciamento de Sítios Contaminados por PCB

E-learning

2012 -2013

Público: Técnicos de todas as Agências Ambientais do Brasil

Ensino à Distância
Pós graduação Lato Sensu

www.mbagac.com

Engenharia Química da Escola Politécnica USP Laboratórios

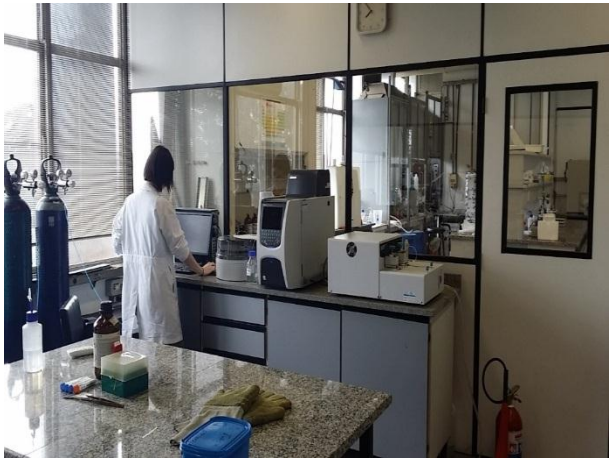
Cromatógrafo Líquido - Espectrômetro de Massa - Ion Trap - Time Of Flight

LCMS

Maldi TOF TOF

GC MS e HPLC

Absorção Atômica



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