Amostragem passiva voltada para análise de agrotóxicos polares e apolares e sua aplicabilidade para monitoramento ambiental

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Departamento de Cientistas e Núcleo de Estudos de Bioética – BSGI

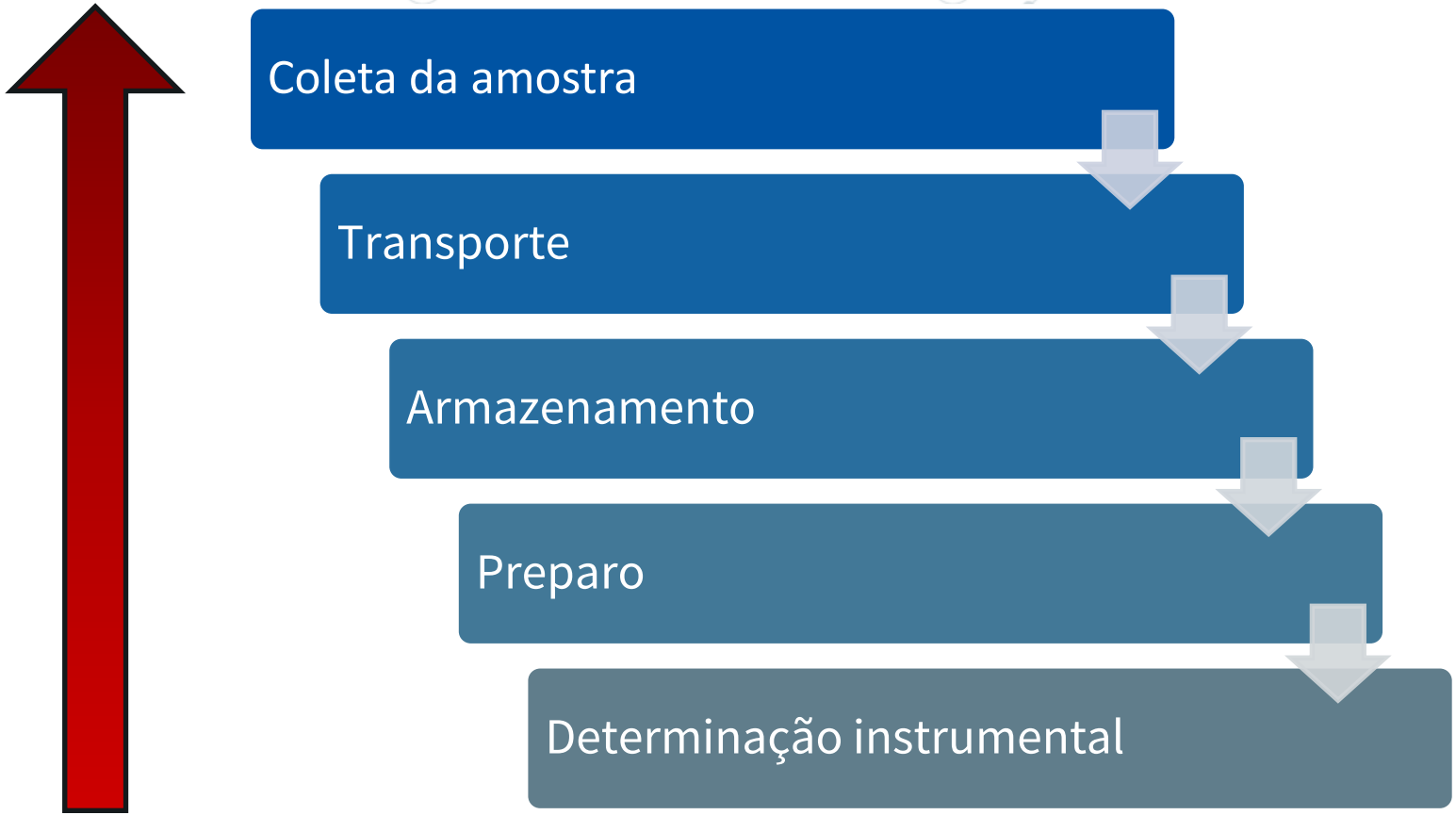
Amostradores passivos

Vantagens

- Possibilitam a coleta e concentração *in situ*
- Fornecem dados integrados temporalmente
- Geram informações com elevada resolução espacial
- Minimizam a possibilidade de adulteração da amostra

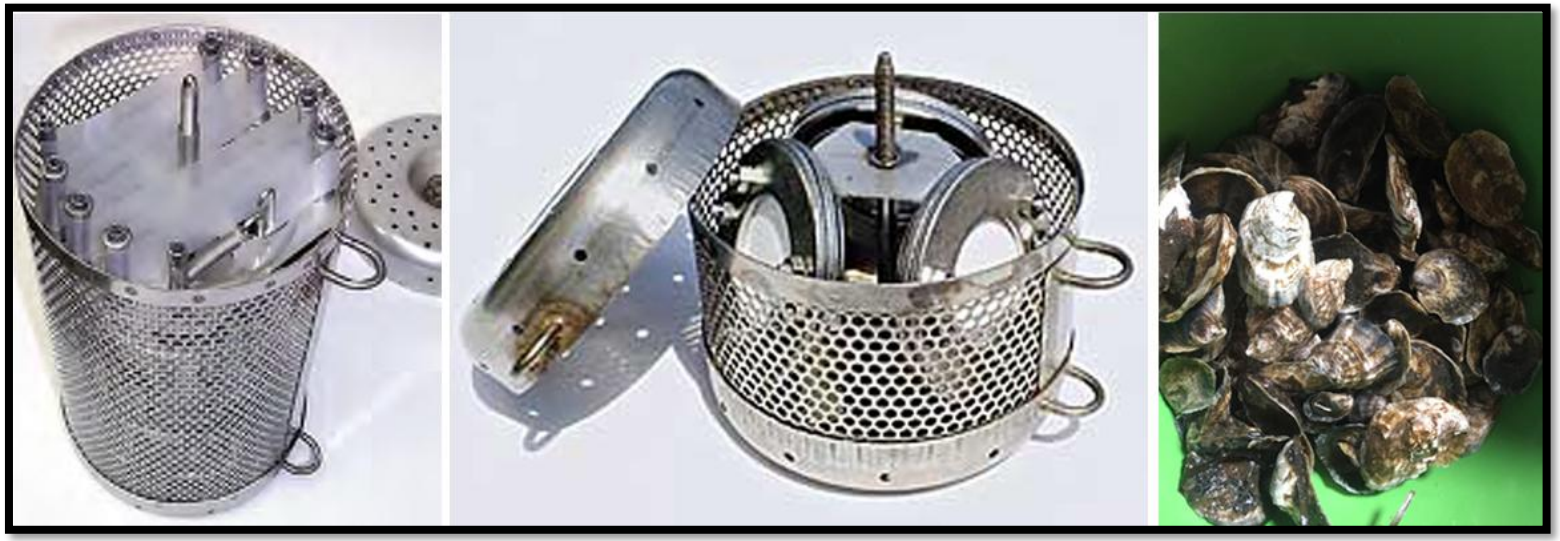
Requisitos desejáveis

- Simples de fabricar e manusear
- Insensíveis a interferentes
- Baixo custo



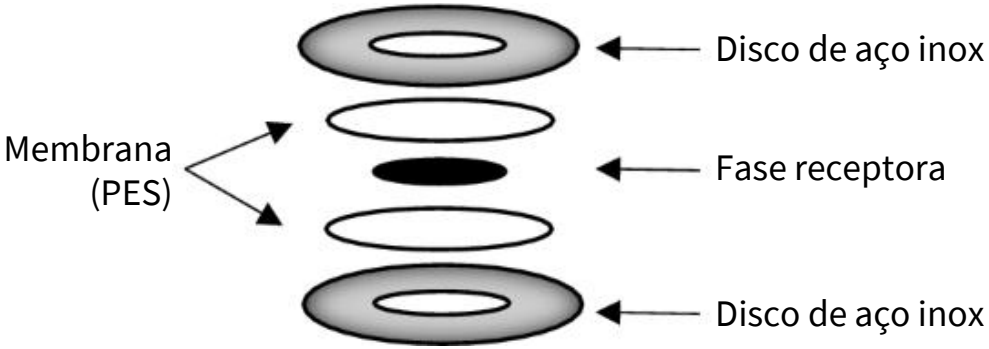
Fontes de erro

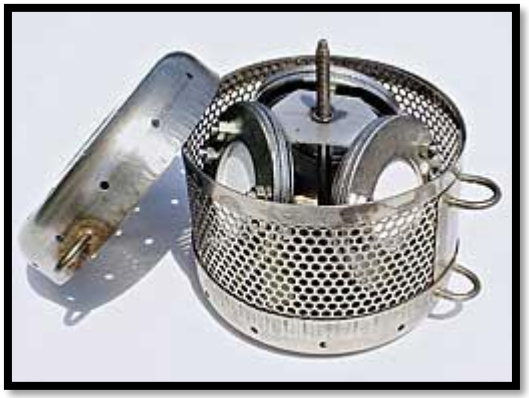
Exemplos



SPMD POCIS Ostras

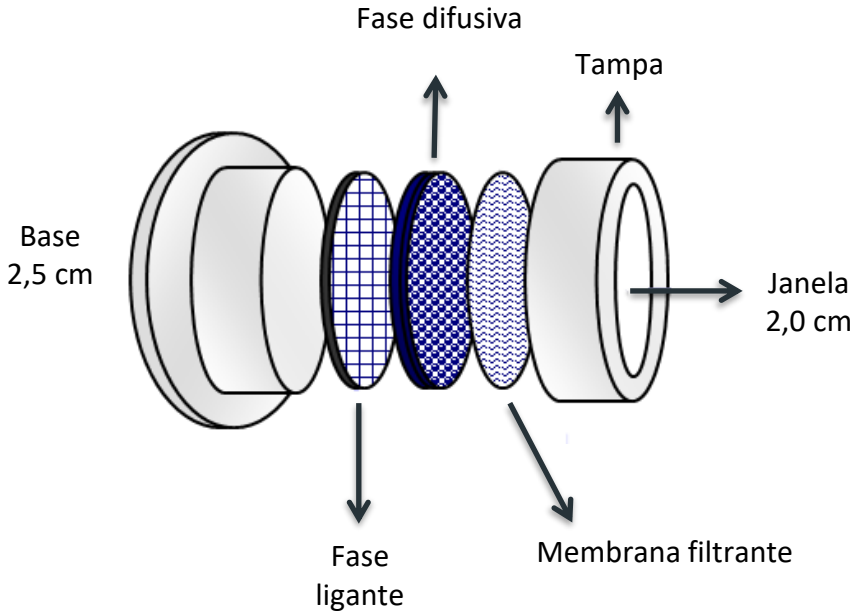
Polar Organic Chemical Integrative Sampler (POCIS)

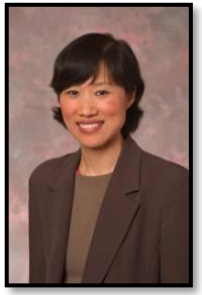




www.est-lab.com/pocis.php

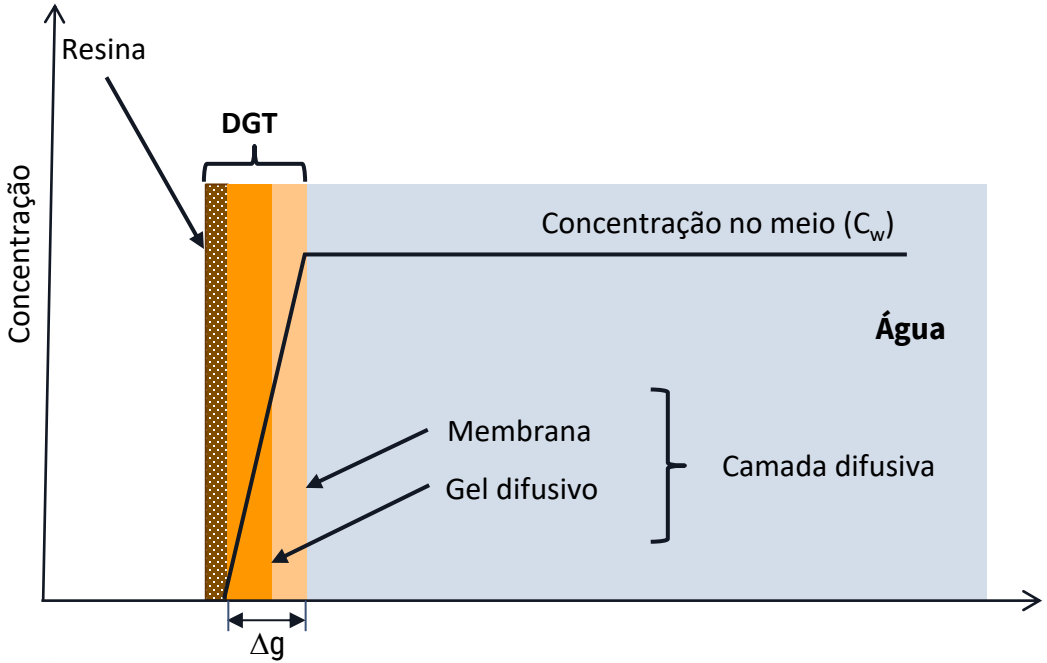
Diffusive Gradient in Thin Films – DGT





Davison, W.; Zhang, H. *Nature*, **1994;** *Analytical Chemistry*, **1995**

Como funciona

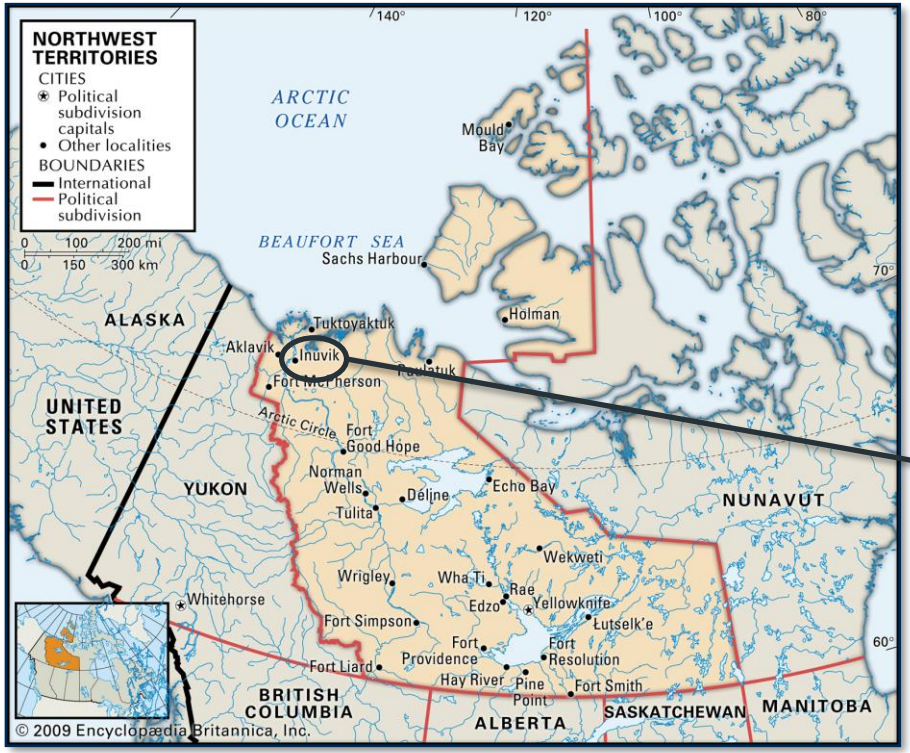


Primeira lei da difusão de Fick

$$C_w = \frac{M\ Ag}{D\ A\ t}$$

M = Massa do analito
Δg = Espessura da camada difusiva
D = Coeficiente de difusão
A = Área de exposição
t = Tempo de exposição

Monitoramento ambiental com apoio da comunidade



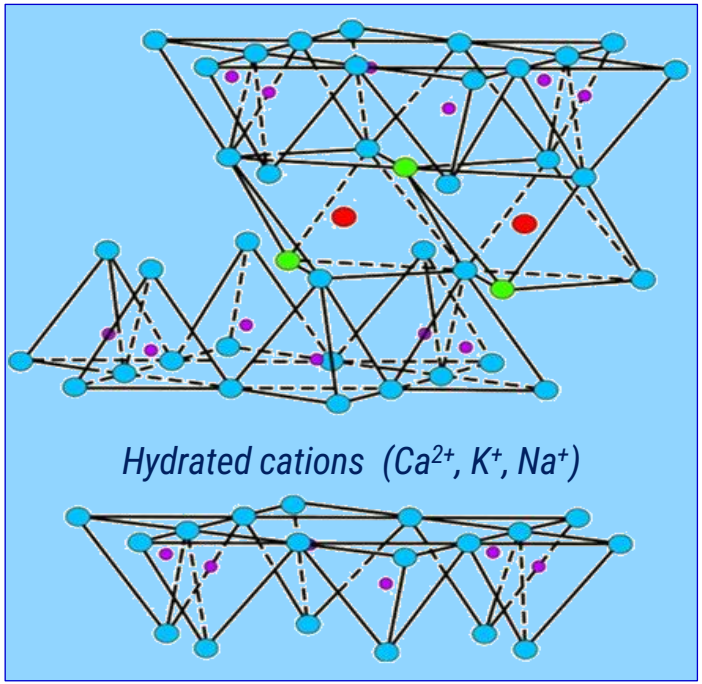
- Cd, Co, Cu, Ni, Pb
- 22 rios
- Julho – Outubro de 2012
- Resultados coerentes com estudos de QA/QC

Resina comercial × Argilominerais

Gilberto Abate

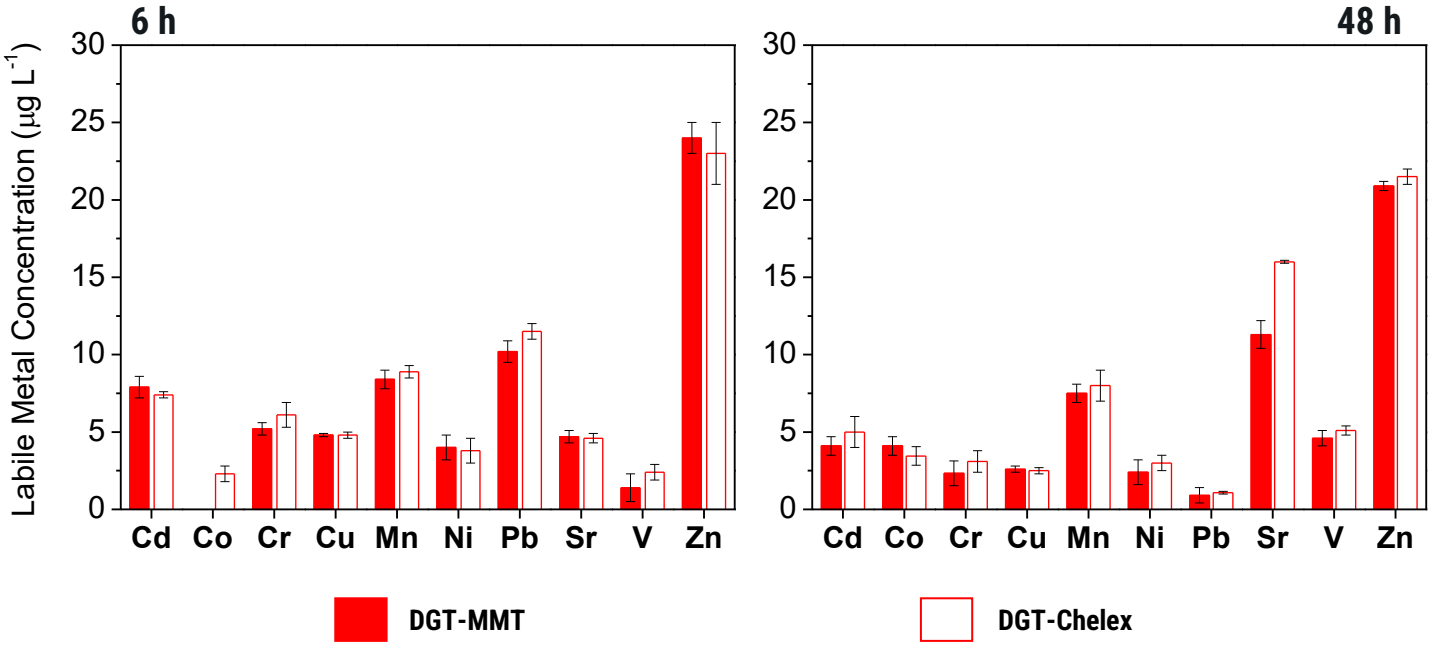
Montmorilonita e vermiculita

- Duas camadas tetraédricas de sílica e uma octaédrica de alumina



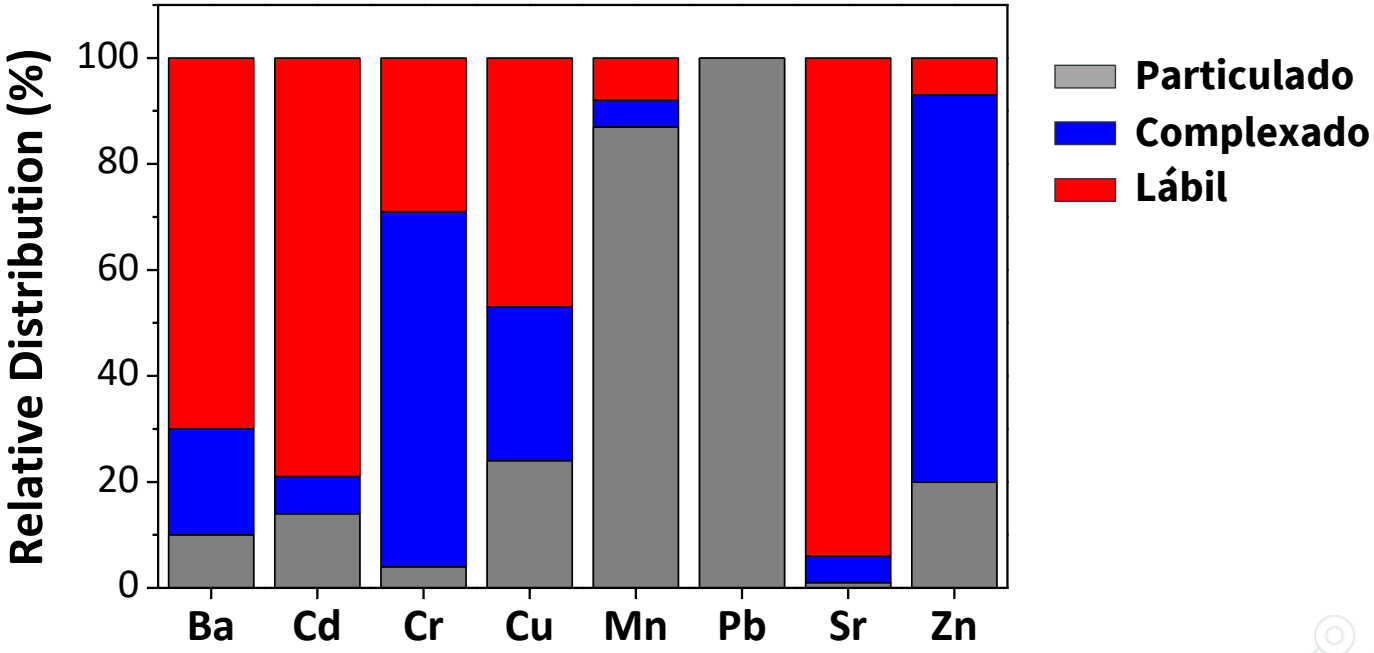
- ✓ Material de origem natural
- ✓ Baixo custo
- ✓ Elevada disponibilidade
- ✓ Uso possível para espécies catiônicas e aniônicas

MMT × Chelex-100



Dos Anjos, Abate, Grassi, *Anal. Bioanal. Chem.* **2017**

Especiação



Dos Anjos, Abate, Grassi, *Anal. Bioanal. Chem.* **2017**

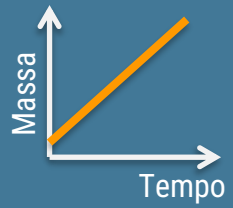
Otimização

Capacidade sortiva
- Espécies metálicas

Dessorção
- Concentração
- Extração

Condições de aplicação
- pH
- Força iônica
- COD
- Material particulado

Determinação do coeficiente de difusão

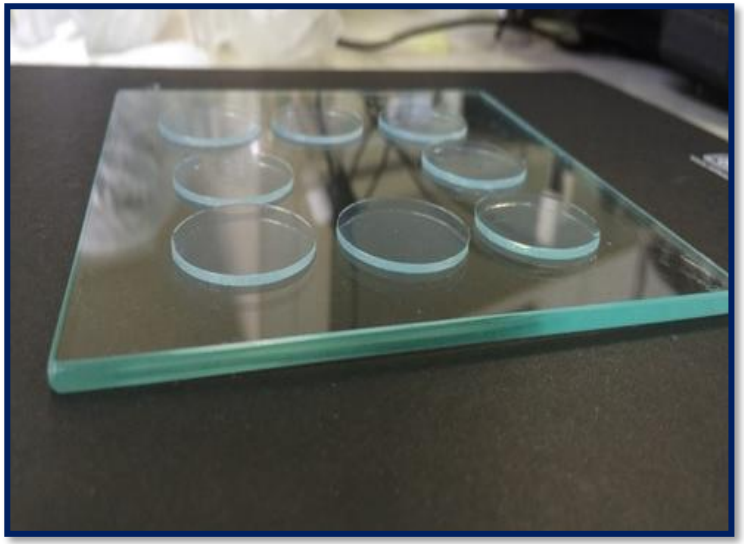


$$D' = \frac{k\,\Delta g}{C\,A}$$

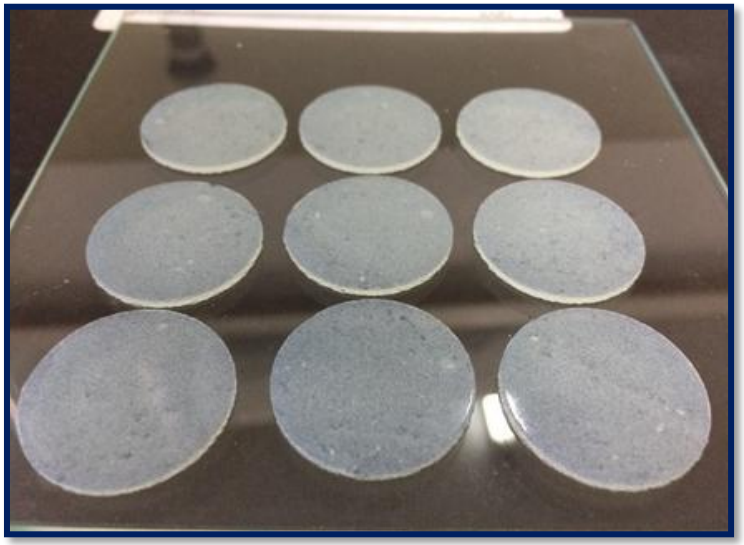
Testes de recuperação
- 3 níveis de concentração

o-DGT

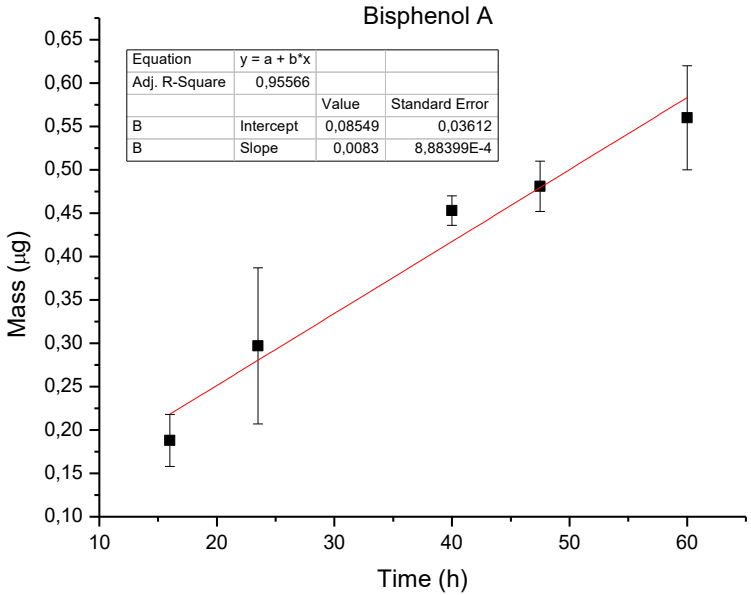
Hidrogel de agarose



Hidrogel com Oasis HLB

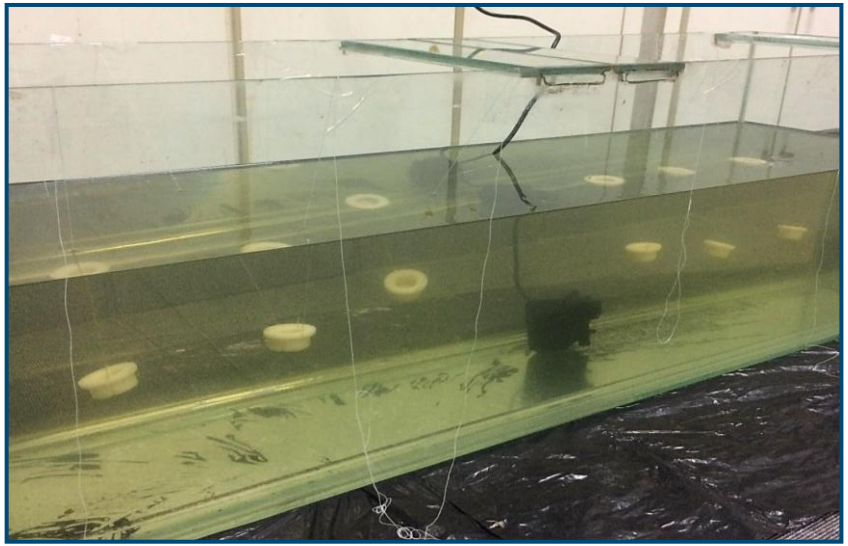


o-DGT



Substância	D' (x10^{-6} cm^2 s^{-1})
Octilfenol	**2,95**
Nonilfenol	**0,750**
Triclosan	**3,37**
Bisfenol A	**4,69**

Aplicação em águas de abastecimento público e de rio



7 dias
pH 7,4
17,3 ± 0,9 °C

Tiago Wacheski

CE	Torneira ng L^{-1} (n = 5)	Rio µg L^{-1} (n = 6)	Fator de concentração
Octylphenol	102 ± 22	10,8 ± 6,4	60
Nonylphenol	403 ± 78	9,5 ± 5,3	15
Triclosan	226 ± 16	0,6 ± 0,4	70
Bisphenol A	250 ± 20	0,05 ± 0,02	100

Wacheski et al., *J. Braz. Chem. Soc.*, **2021**

o-DGT com fases ligantes alternativas

Carvão ativado comercial

- Origem vegetal
- 700 °C

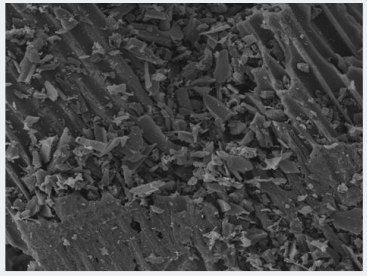
Biocarvão de casca de árvore

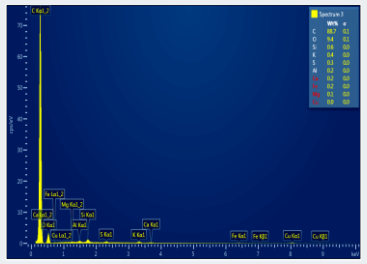
- *Acacia mearnsii* (acácia negra)
- 400 °C

Biocarvão de osso bovino

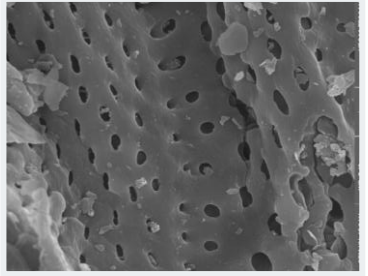
- Resíduos de açougues e matadouros
- 800 °C
- Macerado e peneirado à 100 mesh (0,149 mm)

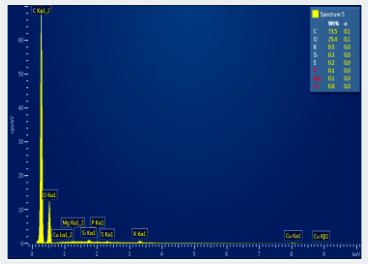
CA



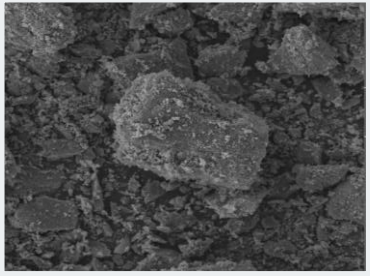


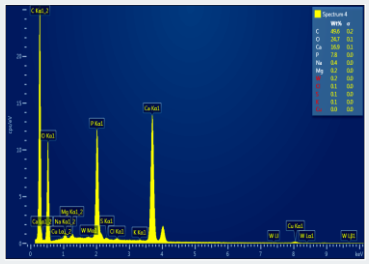
BC



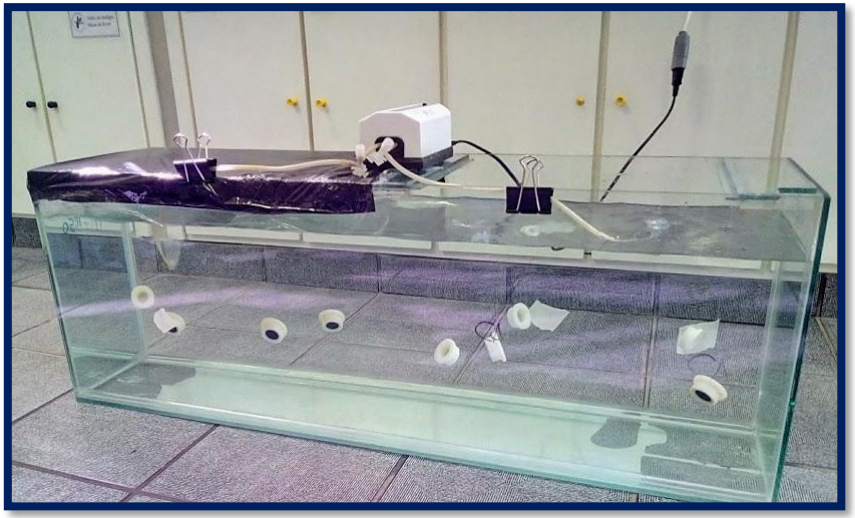


OB





Aplicação em água de abastecimento público



100 L
7 dias

Emerson L. Y. Hara

	Concentratação (ng L^{-1})				
Substância	Ibuprofeno	Octilfenol	Nonilfenol	Triclosan	Bisfenol A
CA	**34**	**53**	**27**	**51**	**29**

o-DGT para pesticidas

Analytica Chimica Acta 966 (2017) 1–10

Contents lists available at ScienceDirect

Analytica Chimica Acta

journal homepage: www.elsevier.com/locate/aca

Passive sampling of anionic pesticides using the Diffusive Gradients in Thin films technique (DGT)

Robin Guibal, Rémy Buzier*, Adeline Charriau, Sophie Lissalde, Gilles Guibaud

University of Limoges, Research Group on Water, Soil and Environment (GRESE), 123 Avenue Albert Thomas, 87060, Limoges Cedex, France

Elution yields (f_e) for HLB (with methanol/ethyl acetate (50:50)) and MAX (with methanol/1 M formic acid (90:10)) binding gels used in this study (SD in parentheses; n = 6).

	HLB (E1 24 h)	MAX (E2 24 h)
Bentazon	97% (15)	74% (8)
Chlorsulfuron	95% (5)	81% (5)
Ioxynil	95% (19)	46% (9)
Mecoprop	95% (9)	86% (7)

o-DGT para pesticidas

Talanta Open 6 (2022) 100123

Contents lists available at ScienceDirect

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journal homepage: www.sciencedirect.com/journal/talanta-open

Sensitivity improvement of o-DGT for organic micropollutants monitoring in waters: Application to neutral pesticides

Rachel Martins de Barros, Juliette Rougerie, Thomas Ballion, Rémy Buzier *, Stéphane Simon, Robin Guibal, Sophie Lissalde, Gilles Guibaud

Université de Limoges, E2Lim, 123 Avenue Albert Thomas, Limoges, Cedex 87060, France

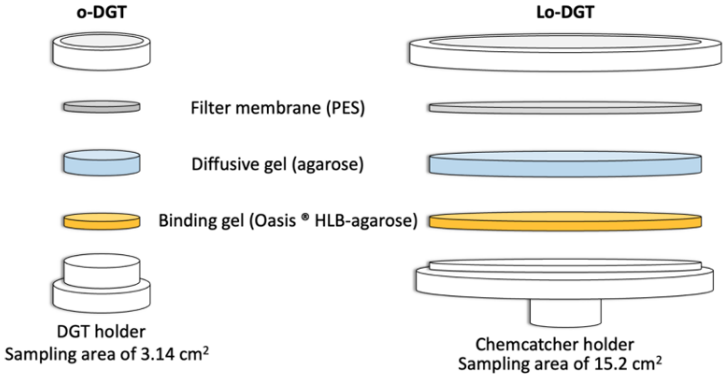


Fig. 1. o-DGT and Lo-DGT configuration.

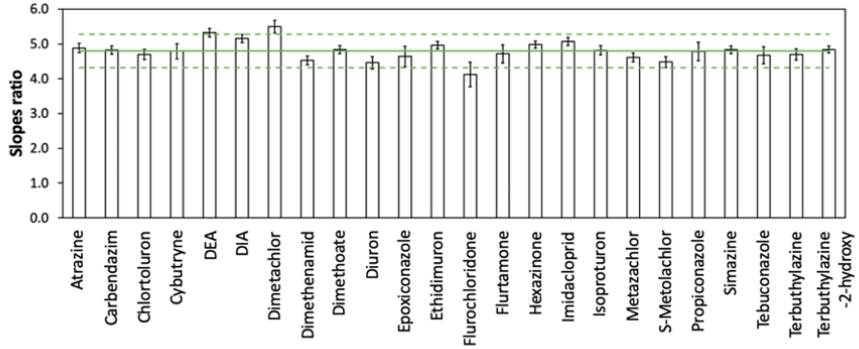
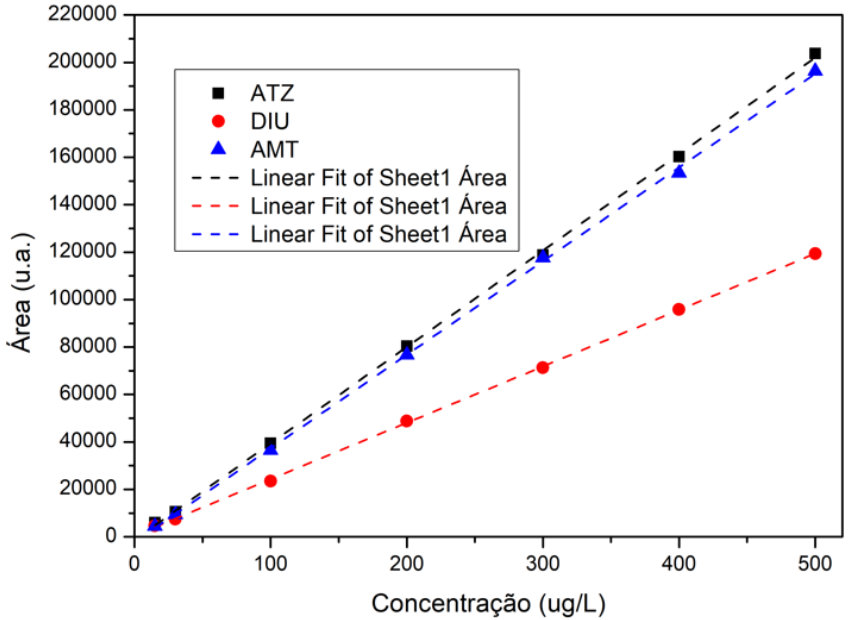
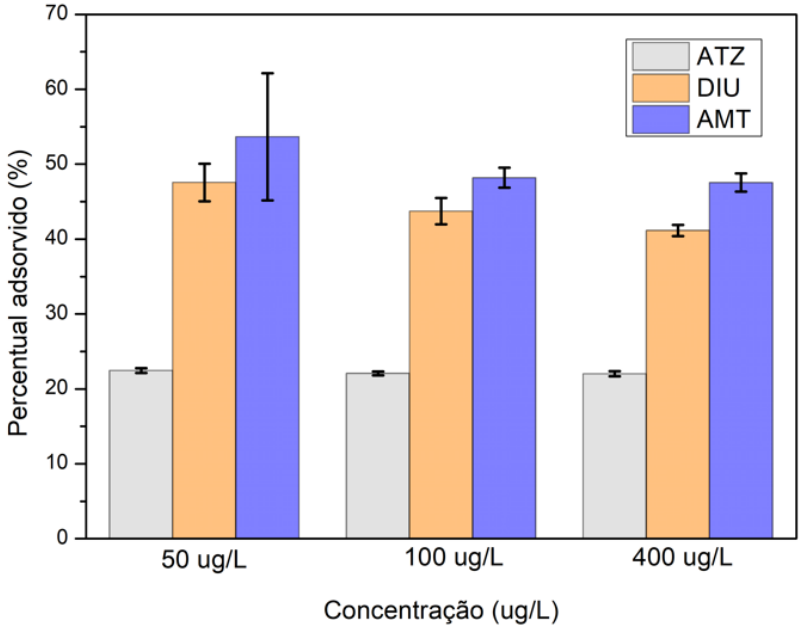


Fig. 4. Ratio of accumulation regression slopes of Lo-DGT to o-DGT. The green lines represent the expected 4.8-ratio with 10% uncertainty.

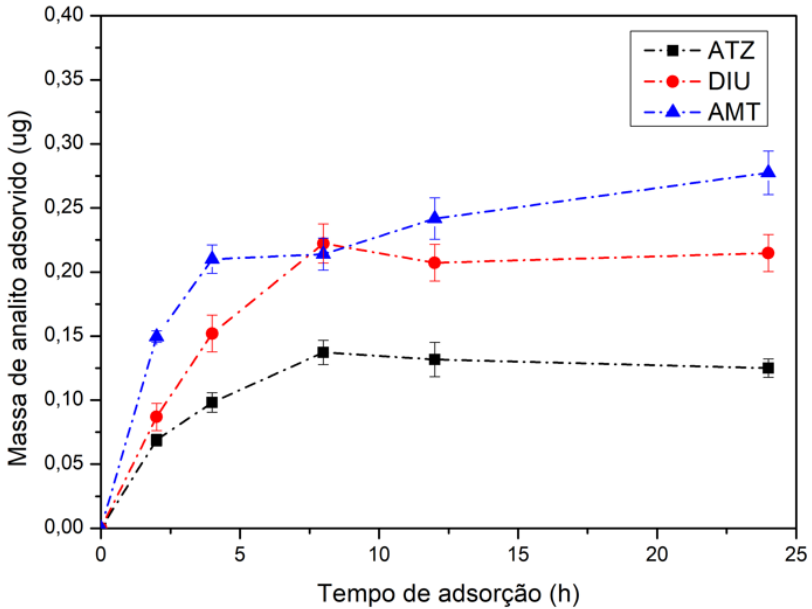
o-DGT com cortiça como fase ligante

o-DGT com cortiça como fase ligante

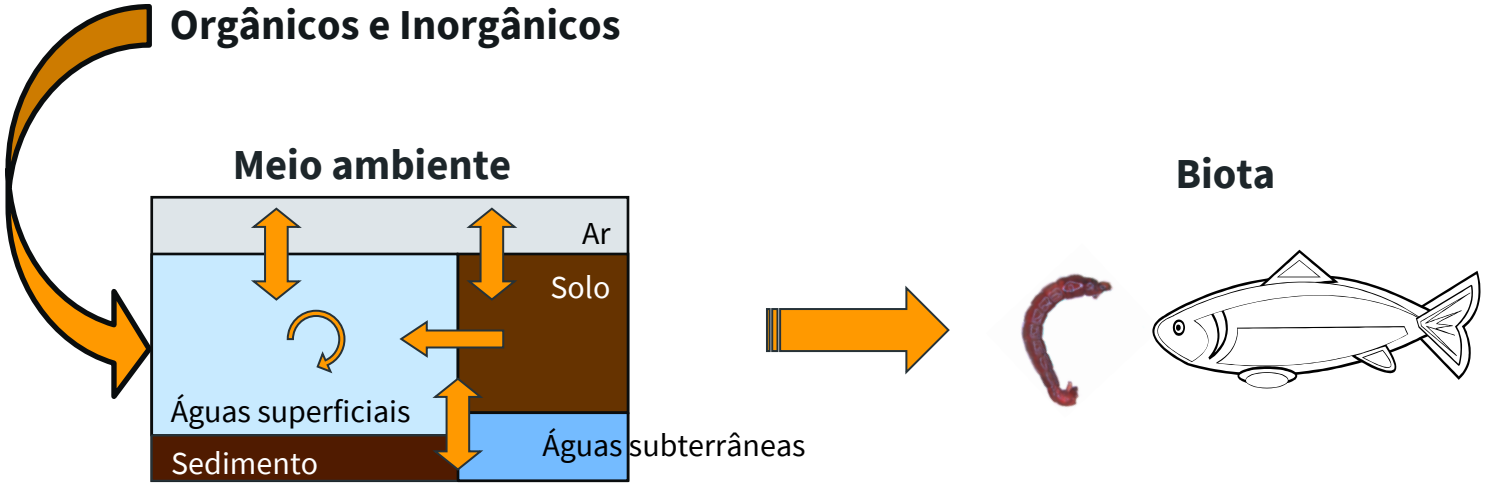




o-DGT com cortiça como fase ligante



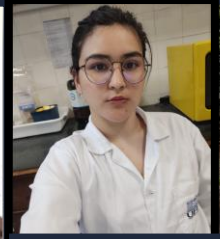
Contaminantes

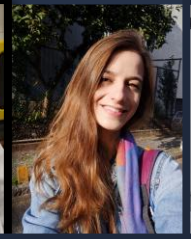


Desenvolvimento analítico

Schwarzembach et al., *Science*, **2006**

Agradecimentos



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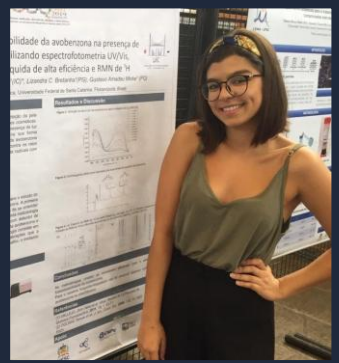


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• Ecotoxicology
• New trends on sample preparation
• Green analytical chemistry methods
• Instrumental and environmental analysis
• Biosensors and eletroanalysis chemometrics
06, 07 and 08
November
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Obrigado!

mtgrassi@ufpr.br | mtgrassi@gmail.com