7
Referências

ALMEIDA, C.M.S. **Estudos sobre a origem e transformação de selênio e de suas espécies químicas ao longo do processo de refino do petróleo.** Dissertação de Mestrado. Pontifícia Universidade Católica, Rio de Janeiro, 2008.

ASSIS, R.A. **Aperfeiçoamento e aplicações de uma metodologia para análise de especiação de arsênio por eletroforese capilar com detector de ICP-MS.** Tese de Doutorado. Pontifícia Universidade Católica, Rio de Janeiro, 2006.

ATHAYDE, G.P.B. **Determinação de As e Mn em diesel, gasolina e nafta por GF AAS e de Cu, Fe, Ni e V em petróleo utilizando SS-GF AAS.** Tese de Doutorado. Pontifícia Universidade Católica, Rio de Janeiro, 2007.

BANDURA, D.R.; BARANOV, V.I.; TANNER, S.D. Reaction chemistry and collisional processes in multipole devices for resolving isobaric interferences in ICP-MS. **Fresenius Journal Analytical Chemistry** 370, 454-470, 2001.

BARANOV, V.I.; TANNER, S.D. A dynamic reaction cell for inductively coupled plasma mass spectrometry. **Journal of Analytical Atomic Spectrometry** 14, 1133-1142, 1999.

BORGES, E.M.; NARDY, A.J.R.; MALAGUTTI, M.I.A. Determinação de arsênio, antimônio e bismuto em rochas por espectrometria de emissão óptica com fonte de plasma acoplado indutivamente (ICP-OES) e geração de hidretos. **Geociências** 24, (3), 319-326, 2005.

CAMPOS, R.C.; CURTIUS, A.J. **Apostila de Absorção Atômica.** Brasil, Rio de Janeiro, 2008. 102p.

CARRION, N.; MURILLO, M.; MONTIEL, E.; DÍAZ, D. Development of a direct hydride generation nebulizer for the determination of selenium by inductively coupled plasma optical emission spectrometry. **Spectrochimica Acta Part B** 58, 1375-1389, 2003.

CASSELLA, R.J.; SANT'ANA, O.D.; RANGEL, A.T.; CARVALHO, M.F.B.; SANTELLI, R.E. Selenium determination by eletrothermal atomic absorption spectrometry in petroleum refinery aqueous streams containing volatile organic compounds. **Microchemical Journal** 71, 21-28, 2002.

CASSELLA, R.J.; SANT'ANA, O.D.; SANTELLI, R.E. Determination of arsenic in petroleum refinery streams by eletrothermal atomic absorption spectrometry after multivariate optimization based on Doehlert design. **Spectrochimica Acta Part B** 57, 1967–1978, 2002.

CHEN, M.; ZOU, A.; YU, Y.; HE, R. Hyphenation of flow injection/sequential injection with chemical hydride/vapor generation atomic fluorescence spectrometry. **Talanta** 73, 599-605, 2007.

CIENFUEGOS, F.; VAITSMAN, D. **Análise Instrumental.** Rio de Janeiro: Ed. Interciência, 2000.

CORREIA, C.L.T. **Determinação de As total em águas oceânicas por HG AFS.** Dissertação de Mestrado. Pontifícia Universidade Católica, Rio de Janeiro, 2010.

D'LLIO, S.; VIOLANTE, N.; DI GREGORIO, M.; SENOFONTE, O.; PETRUCCI, F. Simultaneous quantification of 17 trace elements in blood by dynamic reaction cell inductively coupled plasma mass spectrometry (DRC-ICP-MS) equipped with a high-efficiency sample introduction system. **Analytica Chimica Acta** 579, 202-208, 2006.

D'ULIVO, A.; MESTER, Z.; MEIJA, J.; STURGEON, R.E. Mechanism of Generation of Volatile Hydrides of Trace Elements by Aqueous Tetrahydroborate(III). Mass Spectrometric Studies on Reaction Products and Intermediates. **Analytical Chemistry** 79, 3008-3015, 2007.

DUYCK, C., MIEKELEY, N.; FONSECA, T.C.O.; SEZATMARI, P.; NETO, E.V.S. Trace element distributions in biodegradate crude oils and fractions from the Potiguar Basin, Brazil. **Journal of the Brazilian Chemical Society** 19, N0. 5, 978-986, 2008.

DUYCK, C., MIEKELEY, N.; SILVEIRA, C.L.P.; SZATMARI, P. Trace element determination in crude oil and its fractions by inductively coupled plasma mass spectrometry using ultra sonic nebulization of toluene solutions. **Spectrochimica Acta Part B,** 57, 1979-1990, 2002.

ELWAER, N.; HINTELMANN, H. Comparing the precision of selenium isotope ratio measurements using collision cell and sector field inductively coupled plasma mass spectrometry. **Talanta** 75, 205-214, 2008.

ELWAER, N.; HINTELMANN, H. Comparative performance study of different sample introduction techniques for rapid and precise selenium isotope ratio determination using multi-collector inductively coupled plasma mass spectrometry (MC-ICP/MS). **Anal Bioanal Chem.** 389, 1889-1899, 2007.

FERRARINI, S.F**. Desenvolvimento de metodologia alternativa para a determinação de elementos em nível de traços em amostras de carvão pela técnica de ICP-OES.** Dissertação de Mestrado. Universidade Federal do Rio Grande do Sul. 2007.

GARCIA, J.B.; KRACHLER, M.; CHEN, B.; SHOTYK, W. Improved determination of selenium in plant and peat samples using hydride generation-atomic fluorescence spectrometry (HG-AFS). **Analytica Chimica Acta** 534, 255–261, 2005.

GINÉ-ROSIAS, M.F. **Espectrometria de massas com fonte de plasma.** Piracicaba, SP: CENA, 1999. 118p.

GINÉ-ROSIAS, M.F. **Espectrometria de emissão atômica com plasma acoplado indutivamente.** Piracicaba, SP: CENA, 1998. 148p.

GREENWOOD, N.N.; EARNSHAW, A. **Chemistry of the Elements.** Second edition, U.K.: Butterworth-Heinemann, 1997. 1376p.

HARRIS, D.C. **Análise Química Quantitativa**. 6.ed. Rio de Janeiro: LTC, 2005.

HATTENDORF, B.; GUNTHER, D. Strategies for method development for an inductively coupled plasma mass spectrometer with bandpass reaction cell. Approaches with different reaction gases for the determination of selenium. **Spectrochimica Acta Part B** 58, 1-13, 2003.

HOUK, R.S.; JARVIS, K.E.; GRAY, A.L. **Handbook of Inductively Coupled Plasma Mass Spectrometry.** 1ed., USA: Chapman and Hall, Blackie & Son Ltd., 1992.

JUNIOR, A.G. **Determinação de selênio em água subterrânea utilizando a espectrometria de absorção atômica com atomização eletrotérmica em forno de grafite (GFAAS) e geração de hidretos (HGAAS)**. 2008. Dissertação de mestrado. Instituto de Pesquisas Energética e Nucleares.

KAHEN, K.; STRUBINGER, A.; CHIRINOS, J.R.; MONTASER, A. Direct injection high efficiency nebulizer-inductively coupled plasma mass spectrometry for analysis of petroleum samples. **Spectrochimica Acta Part B** 58, 397-413, 2003.

KARLBERG, B.; PACEY, G.E. **Flow injection analysis – A practical guide.** Amsterdam, Holanda: Elsevier, vol.10, 1989. 372p.

KUMAR, A.R.; RIYAZUDDIN, P. Studies on the efficiency of hydrogen selenide generation with different acid media by continuous flow hydride generation atomic absorption spectrometry. **Microchimica Acta** 155, 387-396, 2006.

KUO, C.; JIANG, S. Determination of selenium and tellurium compounds in biological samples by ion chromatography dynamic reaction cell inductively coupled plasma mass spectrometry. **Journal of Chromatography A** 1181, 60-66, 2008.

LEMLY, A.D. Aquatic selenium pollution is a global environmental safety issue. **Ecotoxicology and Environmental Safety** 59, 44-56, 2004.

LIENEMANN, C.P.; DREYFUS, S.; PECHEYRAN, C.; DONARD, O.F.X. Trace Metal Analysis in Petroleum Products: Sample Introduction Evaluation in ICP-OES and Comparison with an ICP-MS Approach. **Oil & Gas Science and Technology – Rev. IFP**, 62, no. 1, 69-77, 2007.

LIU, Q. On line pre-reduction of Se(VI) by nano-TiO_2 controlled volatilization for speciation analysis of inorganic selenium using HPLC-AFS. **Microchimica Acta** 167, 141-145, 2009.

MAESTRE, S.E.; TODOLI, J.L.; MERMET, J.M. Evaluation of several pneumatic micronebulizers with different designs for use in ICP-AES and ICP-MS. Future directions for further improvement. **Analytical Bioanalytical Chemistry** 379, 888-899, 2004.

MANNING, T.J.; GROW, W.R. **Inductively Coupled Plasma - Atomic Emission Spectrometry.** Valdosta: The chemical educator, vol.2, n.01, 1997.

MARIANO, J.B. **Impactos ambientais do refino de petróleo.** Dissertação de Mestrado. Universidade Federal do Rio de Janeiro – COPPE, 2001.

MONTASER, A. **Inductively Coupled Plasma Mass Spectrometry.** Washington, D.C., USA: Wiley-VCH, 1998. 964p.

MOURA, F.A.L., **Avaliação da digestão de amostras de piche assistida por radiação de microondas e determinação de metais por ICP OES**. Dissertação de mestrado. Universidade Federal Fluminense, 2006.

MUSIL, S.; MATOUSEK, T. On-line pre-reduction of pentavalent arsenicals by thioglycolic acid for speciation analysis by selective hydride generation-cryotrapping-atomic absorption spectrometry. **Spectrochimica Acta Part B** 63, 685-691, 2008.

PEREIRA, R.C. **Desenvolvimento e aplicação de uma nova metodologia para análise de especiação de selênio em efluentes hídricos de refinarias de petróleo.** Dissertação de mestrado. Pontifícia Universidade Católica, Rio de Janeiro, 2004.

PETRY, C.F.; POZEBON, D.; BENTLIN, F.R.S. Evaluation of ICP OES applicability for trace element determination in environmental samples. **Atomic Spectroscopy** 26, issue 1, 19-27, 2005.

PYRZYNSKA, K. Determination of Selenium species in environmental samples. **Microchimica Acta** 140, 55-62, 2002.

QIU, J.; WANG, Q.; MA, Y.; YANG, L.; HUANG, B. On-line pre-reduction of Se(VI) by thiourea for selenium speciation by hydride generation. **Spectrochimica Acta Part B** 61, 803-809, 2006.

REYES, M.N.M.; CERVERA, M.L.; GUARDIA, M. Determination of total Sb, Se, Te and Bi and evaluation of their inorganic species in garlic by hydride-generation-atomic-fluorescence spectrometry. **Analytical and Bioanalytical Chemistry** 394, 1557-1562, 2009.

ROUESSAC, F.; ROUESSAC, A. Chemical **analysis: modern instrumental methods and techniques**. Chichester: John Wiley & Sons, 2000. 445p.

SCHLOSKE, L.; WALDNER, H.; MARX, F. Optimisation of sample pre-treatment in the HG-AAS selenium analysis. **Analytical and Bioanalytical Chemistry** 372, 700-704, 2002.

SILVA, A.L.O.; BARROCAS, P.R.G.; JACOB, S.C.; MOREIRA, J.C. Dietary intake and health effects of selected toxic elements. **Brazilian Journal of Plant Physiology** 17 (1), 79-93, 2005.

SKOOG, D.A.; HOLLER, F.J.; CROUCH, S.R. **Princípios de Análise Instrumental.** 6ª ed., Porto Alegre, Brasil: Bookman, 2009. 1056p.

SLOTH, J.J.; LARSEN, E.H. The application of inductively coupled plasma dynamic reaction cell mass spectrometry for measurement of selenium isotopes, isotope ratios and chromatographic detection of selenoamino acids. **Journal of Analytical Atomic Spectrometry** 15, 669-672, 2000.

SOUZA, R.M. **Desenvolvimento de métodos analíticos para determinação de elementos-traço em amostras oleosas e pastosas por ICP OES e ICP-MS.** Tese de Doutorado. Pontifícia Universidade Católica, Rio de Janeiro, 2007.

STIGTER, J.B.; HAAN, H.P.M.; GUICHERIT, R.; DEKKERS, C.P.A.; DAANE, M.L. Determination of cadmium, zinc, copper, chromium and arsenic in crude oil cargoes. **Environmental Pollution** 107, 451-464, 2000.

STOEPPLER, M. **Hazardous metals in the environment.** Amsterdam, Holanda: Elsevier, vol.12, 1992. 541p.

STRIPEIKIS, J.; TUDINO, M.; TROCCOLI, O.; WUILLOUD, R.; OLSINA, R.; MARTINEZ, L. On-line copper and iron removal and selenium (VI) pre-reduction for the determination of total selenium by flow-injection hydride generation-inductively coupled plasma optical emission spectrometry. **Spectrochimica Acta Part B** 56, 93-100, 2001.

TAKASE, I.; PEREIRA, H.B.; LUNA, A.S.; GRINBERG, P.; CAMPOS, R.C. A Geração química de vapor em espectrometria atômica. **Química Nova** 25, No 06 B, 1132-1144, 2002.

TANNER, S.D.; BARANOV, V.I. A dynamic reaction cell for inductively coupled plasma mass spectrometry (ICP-DRC-MS). II. Reduction of interferences produced within the cell. **Journal of the American Society for Mass Spectrometry** 10, 1083-1094, 1999.

TANNER, S.D.; BARANOV, V.I.; VOLLKOPF, U. A dynamic reaction cell for inductively coupled plasma mass spectrometry (ICP-DRC-MS). Part III. Optimization and analytical performance. **Journal of Analytical Atomic Spectrometry** 15, 1261-1269, 2000.

TAYLOR, H.E. **Inductively Coupled Plasma-Mass Spectrometry–Practices and Techniques.** Boulder, Colorado: Academic Press, 2001. 294p.

TODOLI, J.L.; MERMET, J.M. Sample introduction systems for the analysis of liquid microsamples by ICP-AES and ICP-MS. **Spectrochimica Acta Part B** 61, 239-283, 2006.

TONIETTO, G.B. **Estudo da especiação química de arsênio e selênio em correntes aquosas e efluentes de refinaria de petróleo.** Dissertação de Mestrado. Pontifícia Universidade Católica, Rio de Janeiro, 2005.

TORMEN, L.; GIL, R.A.; FRESCURA, V.L.A.; MARTINEZ, L.D.; CURTIUS, A.J. Determination of trace elements in biological samples treated with formic acid by inductively coupled plasma mass spectrometry using a microconcentric nebulizer. **Spectrochimica Acta Part B** 65, 959-966, 2010.

VOKAL-BOREK, H. **Selenium - University of Stockholm.** Second printing, Stockholm, Suécia, 1980.

WANG, R.; HSU, Y.; CHANG, L.; JIANG, S. Speciation analysis of arsenic and selenium compounds in environmental and biological samples by ion chromatography-inductively coupled plasma dynamic reaction cell mass spectrometer. **Analytica Chimica Acta** 590, 239-244, 2007.

WANG, T.; JIA, X.; WU, J. Direct determination of metals in organics by inductively coupled plasma atomic emission spectrometry in aqueous matrices. **Journal of Pharmaceutical and Biomedical Analysis** 33, 639-646, 2003.

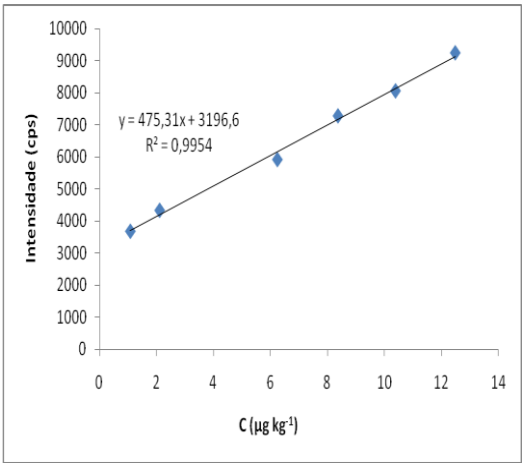
WOODS, G.D.; FRYER, F.I. Direct elemental analysis of biodiesel by inductively coupled plasma–mass spectrometry. **Analytical and Bioanalytical Chemistry** 389, 753-761, 2007.

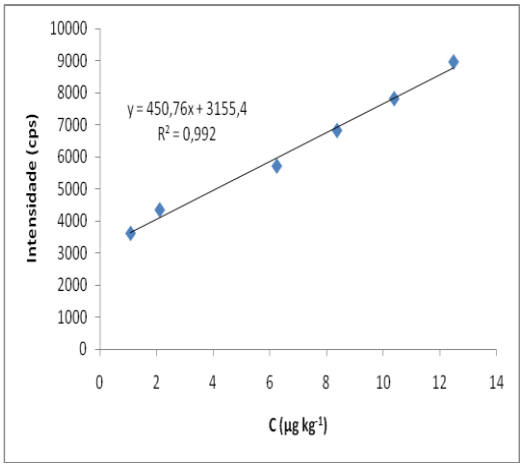
XU, S.; STURGEON, R.E. Flow injection chemical vapor generation of Au using a mixed reductant. **Spectrochimica Acta Part B** 60, 101-107, 2005.

ZHANG, Y.; ADELOJU, S.B. Flow injection-hydride generation atomic absorption spectrometric determination of selenium, arsenic and bismuth. **Talanta** 76, 724-730, 2008.

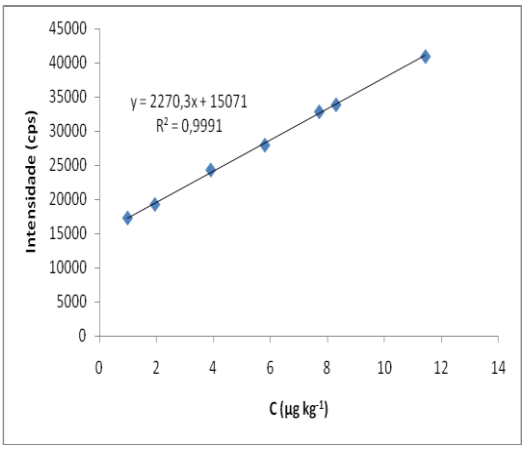
8
Anexo I

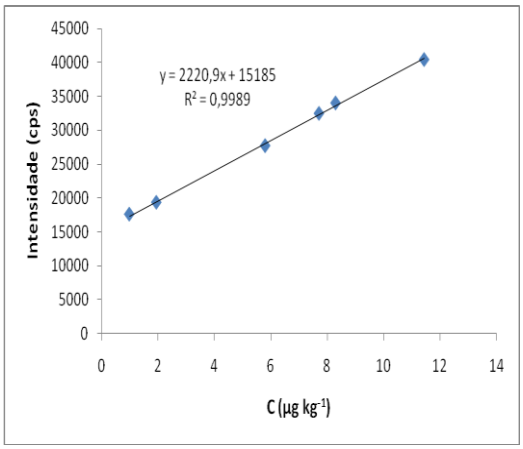
Curvas analíticas utilizadas na determinação de Se no MRC NIST 1634c para as replicatas analisadas:





Curvas analíticas utilizadas na determinação de As no NIST 1634c para as replicatas analisadas:





9
Anexo II

Tabela dos parâmetros empíricos da equação de Antoine

$$\log p = A - \frac{B}{C+T}$$

Substância	Fórmula	A	B	C
Acetona	C_3H_6O	7.02447	1161.00	224.00
Ácido acético	$C_2H_4O_2$	7.18807	1416.70	211.00
Água	H_2O	7.96681	1668.21	228.00
Anilina	C_6H_7N	7.24179	1675.30	200.00
Benzeno	C_8H_6	6.90565	1211.03	220.79
i-Butano	C_4H_{10}	6.74808	882.80	240.00
n-Butano	C_4H_{10}	6.83029	945.90	240.00
Estireno	C_8H_8	6.92409	1420.00	206.00
Etanol	C_2H_6O	8.04494	1554.30	222.65
Éter dietílico	$C_4H_{10}O$	6.78574	994.20	220.00
Etilbenzeno	C_8H_{10}	6.95719	1424.26	213.21
Etilenoglicol		7.88080	1957.00	193.80
n-Heptano	C_7H_{16}	6.90240	1268.12	216.90
n-Hexano	C_6H_{14}	6.87776	1171.53	222.37
n-Octano	C_8H_{18}	6.92370	1355.13	209.52
i-Pentano	C_5H_{12}	6.78967	1020.01	233.10
n-Pentano	C_5H_{12}	6.85221	1064.63	232.00
Tolueno	C_7H_8	6.95464	1344.80	219.48
o-Xileno	C_8H_{10}	6.99891	1474.68	213.69
m-Xileno	C_8H_{10}	7.00908	1462.27	215.11
p-Xileno	C_8H_{10}	6.99052	1453.43	215.31