

## ЛИТЕРАТУРА

1. Адсорбция из растворов на поверхностях твердых тел / Ч. Джайлс, Б. Инграм, Дж. Клуни [и др.] ; ред. Г. Парфит, К. Рочестер : пер. с англ. – М. : Мир, 1986. – 488 с.
2. Водяницкий, Ю. Н. Хром и мышьяк в загрязненных почвах (обзор литературы) // Почвоведение. – 2009. – № 5. – С. 551–559.
3. Зельдович, Я. Б. К теории изотермы адсорбции Фрейндлиха // Зельдович, Я. Б. Избранные труды. Химическая физика и гидродинамика. – М. : Наука, 1984. – С. 54–65.
4. Крайнов, С. Р. Геохимия подземных вод. Теоретические, прикладные и экологические аспекты / С. Р. Крайнов, Б. Н. Рыженко, В. М. Швец. – М. : Наука, 2004. – 677 с.
5. Мотузова, Г. В. Фракционирование почвенных соединений мышьяка / Г. В. Мотузова, Р. С. Аптикаев, Е. А. Карпова // Почвоведение. – 2006. – № 4. – С. 432–442.
6. Печенюк, С. И. Сорбция анионов на оксигидроксидах металлов (обзор) // Сорбционные и хроматографические процессы. – 2008. – Т. 8, № 3. – С. 380–429.
7. Пузанов, А. В. Мышьяк в системе почвы–природные воды–растения Алтай / А. В. Пузанов, С. В. Бабошкина // Почвоведение. – 2009. – № 9. – С. 1073–1082.
8. Рыженко, Б. Н. Модель формирования загрязнения подземных вод мышьяком. 2. Влияние сорбции / Б. Н. Рыженко, Е. В. Черкасова, О. А. Лиманцева // Геохимия. – 2009. – № 10. – С. 1041–1049.
9. Химическая энциклопедия. Т. 3. – М. : Сов. энцикл., 1988. – С. 304–318.
10. Wang, Y. Модель формирования загрязнения подземных вод мышьяком. I. Провинция Датун (Китай) / Y. Wang, T. Ma, B. N. Ryzenko, O. A. Limantseva, E. V. Cherkasova // Геохимия. – 2009. – № 7. – С. 757–768.
11. Acharyya, S. K. Comment on: «Mobility of arsenic in West Bengal aquifers conducting low and high groundwater arsenic. Part I: Comparative hydrochemical and hydrogeological characteristics» by Bibhash Nath, Doris Stüben, Sukumar Basu Mallik, Debashis Chatterjee, Laurent Charlet // Appl. Geochem. – 2009. – Vol. 24, N 1. – P. 184–185.
12. Aggett, J. Detailed model for the mobility of arsenic in lacustrine sediments based on measurements in Lake Ohakuri / J. Aggett, G. A. O'Brien // Environ. Sci. & Technol. – 1985. – Vol. 19, N 3. – P. 231–238.
13. Aggett, J. Insight into the mechanism of accumulation of arsenate and phosphate in hydro lake sediments by measuring the rate of dissolution with ethylenediamine-tetraacetic acid / J. Aggett, L. S. Roberts // Environ. Sci. & Technol. – 1986. – Vol. 20, N 2. – P. 183–186.
14. Aggett, J. The extent of formation of arsenic(III) in sediment interstitial waters and its release to hypolimnetic waters in Lake Ohakuri / J. Aggett, M. R. Kriegman // Water Research. – 1988. – Vol. 22, N 4. – P. 407–411.

15. Ahmann, D. Microbial mobilization of arsenic from sediments of the Aberjona watershed / D. Ahmann, L. R. Krumholz, H. F. Hemond, D. R. Lovley, F. M. M. Morel // *Environ. Sci. & Technol.* – 1997. – Vol. 31, N 10. – P. 2923–2930.
16. Allison, J. D. MINTEQA2/PRODEFA2, A Geochemical Assessment Model for Environmental Systems: Version 3.0 User's Manual, Version 3.11 Databases / J. D. Allison, D. S. Brown, K. J. Novo-Gradac ; U.S. EPA. – Athens, GA, 1991. – no [41, 203].
17. Allison, J. D. Partition Coefficients for Metals in Surface Water, Soil, and Waste / J. D. Allison, T. L. Allison // EPA/600/R-05/074. – Washington, DC, 2005. – 93 p. – URL: <http://www.epa.gov/athens/publications/reports/Ambrose600R05074PartitionCoefficients.pdf>
18. Alvarez-Benedi, J. Adsorption–desorption of arsenate in three Spanish soils / J. Alvarez-Benedi, S. Bolado, I. Cancillo, C. Calvo, D. Garcia-Sinovas // *Vadose Zone J.* – 2005. – Vol. 4, N 2. – P. 282–290.
19. Amirbahman, A. Kinetics of sorption and abiotic oxidation of arsenic(III) by aquifer materials / A. Amirbahman, D. B. Kent, G. P. Curtis, J. A. Davis // *Geochimica et Cosmochimica Acta.* – 2006. – Vol. 70, N 3. – P. 533–547.
20. Anawar, H. M. Mobilization of arsenic from subsurface sediments by effect of bicarbonate ions in groundwater / H. M. Anawar, J. Akai, H. Sakugawa // *Chemosphere.* – 2004. – Vol. 54, N 6. – P. 753–762.
21. Anderson, M. A. Arsenate adsorption on amorphous aluminum hydroxide / M. A. Anderson, J. F. Ferguson, J. Gavis // *J. of Colloid & Interface Sci.* – 1976. – Vol. 54, N 3. – P. 391–399.
22. Anderson, M. A. The adsorption of protolyzable anions on hydrous oxides at the isoelectric pH / M. A. Anderson, D. T. Malotky // *J. of Colloid & Interface Sci.* – 1979. – Vol. 72, N 3. – P. 413–427.
23. Anderson, M. A. Influence of aggregation on the uptake kinetics of phosphate by goethite / M. A. Anderson, M. I. Tejedor-Tejedor, R. R. Stanforth // *Environ. Sci. & Technol.* – 1985. – Vol. 19, N 7. – P. 632–637.
24. Appelo, C. A. J. Modeling in situ iron removal from groundwater with trace elements such as As / C. A. J. Appelo, W. W. J. M. de Vet // *Arsenic in Ground Water* / ed. A. H. Welch, K. G. Stollenwerk. – Dordrecht, The Netherlands : Kluwer Academic Publishers, 2003. – Chap. 14. – P. 381–402.
25. Appelo, C. A. J. *Geochemistry, Groundwater and Pollution*, 2<sup>nd</sup> edn. / C. A. J. Appelo, D. Postma. – Leiden : Balkema, 2005. – 650 p. – no [26].
26. Appelo, C. A. J. Geochemical experimentation and modelling are tools for understanding the origin of arsenic in groundwater in Bangladesh and elsewhere // *Arsenic in Groundwater: A World Problem: Seminar Utrecht 29 November 2006* / ed. T. Appelo. – Netherlands National Committee of the IAH, 2008. – P. 33–50. – URL: [http://www.igrac.net/dynamics/modules/SFIL0100/view.php?fil\\_Id=107](http://www.igrac.net/dynamics/modules/SFIL0100/view.php?fil_Id=107)
27. Application of Chemical Reaction Codes // *Understanding Variation in Partition Coefficient,  $K_d$ , Values. Vol. I.  $K_d$  Model, Measurement Methods, and Application of Chemical Reaction Code: EPA 402-R-99-004A / US EPA, US DOE.* – Washington, DC, 1999. – P. 5.1–5.51. – URL: [http://www.epa.gov/radiation/docs/kdreport/vol1/402-r-99-004a\\_ch5.pdf](http://www.epa.gov/radiation/docs/kdreport/vol1/402-r-99-004a_ch5.pdf)
28. Arai, Y. X-ray absorption spectroscopic investigation of arsenate and arsenite adsorption at the aluminum oxide-water interface / Y. Arai, E. J. Elzinga, D. L. Sparks // *J. of Colloid & Interface Sci.* – 2001. – Vol. 235, N 1. – P. 80–88.

29. Arai, Y. Residence time effects on arsenate surface speciation at the aluminum oxide-water interface / Y. Arai, D. L. Sparks // *Soil Sci.* – 2002. – Vol. 167, N 5. – P. 303–314.
30. Arsenic Geochemistry and  $K_d$  Values // *Understanding Variation in Partition Coefficient,  $K_d$  Values*. Vol. III. Review of Geochemistry and Available  $K_d$  Values for Americium, Arsenic, Curium, Iodine, Neptunium, Radium, and Technetium: EPA 402-R-99-004C / US EPA, US DOE. – Washington, DC, 2004. – P. 5.14–5.23. – URL: <http://www.epa.gov/radiation/docs/kdreport/vol3/402-r-04-002c.pdf>
31. Baes, C. F., III. A proposal for estimation of soil leaching and leaching constants for use in assessment models / C. F. Baes, III, R. D. Sharp // *J. of Environ. Quality.* – 1983. – Vol. 12, N 1. – P. 17–28.
32. Belzile, N. Interactions between arsenic and iron oxyhydroxides in lacustrine sediments / N. Belzile, A. Tessier // *Geochimica et Cosmochimica Acta.* – 1990. – Vol. 54, N 1. – P. 103–109.
33. Benjamin, M. M. Effects of strong binding of anionic adsorbates on adsorption of trace metals on amorphous iron oxyhydroxide / M. M. Benjamin, N. S. Bloom // *Adsorption from Aqueous Solutions* / ed. P. H. Tenari. – N. Y. : Plenum Press, 1981. – P. 41–60. – no [30].
34. Bethke, C. M. How the  $K_d$  approach under mines groundwater cleanup / C. M. Bethke, P. V. Brady // *Ground Water.* – 2000. – Vol. 38, N 3. – P. 435–443.
35. Bigham, J. M. A poorly crystallized oxyhydroxysulfate of iron formed by bacterial oxidation of Fe(II) in acid mine waters / J. M. Bigham, U. Schwertmann, L. Carlson, E. Murad // *Geochimica et Cosmochimica Acta.* – 1990. – Vol. 54, N 10. – P. 2743–2758.
36. Bostick, B. C. Arsenite sorption on troilite (FeS) and pyrite (FeS<sub>2</sub>) / B. C. Bostick, S. Fendorf // *Geochimica et Cosmochimica Acta.* – 2003. – Vol. 67, N 5. – P. 909–921.
37. Howell, R. J. Sorption of arsenic by iron oxides and oxyhydroxides in soils // *Applied Geochemistry.* – 1994. – Vol. 9, N 3. – P. 279–286.
38. Brannon, J. M. Fixation, transformation, and mobilization of arsenic in sediments / J. M. Brannon, W. H. Patrick, Jr. // *Environ. Sci. & Technol.* – 1987. – Vol. 21, N 5. – P. 450–459.
39. Brusseau, M. L. Impact of chemical and biochemical reactions on transport of environmental pollutants in porous media // P. M. Huang et al. (ed.) *Soil Chemistry and Ecosystem Health / SSSA Spec. Publ. 52.* – Madison, WI : SSSA, 1998. – P. 173–189. – no [270].
40. Carignan, R. Trace metal deposition and mobility in the sediments of two lakes near Sudbury, Ontario / R. Carignan, J. O. Nriagu // *Geochimica et Cosmochimica Acta.* – 1985. – Vol. 49, N 8. – P. 1753–1764.
41. Carrillo, A. Adsorption of arsenic by natural aquifer material in the San Antonio-El Triunfo mining area, Baja California, Mexico / A. Carrillo, J. I. Drever // *Environ. Geology.* – 1998. – Vol. 35, N 4. – P. 251–257.
42. Chen, S. L. Arsenic species in groundwaters of the Blackfoot disease area, Taiwan / S. L. Chen, S. R. Dzung, M. H. Yang, K. H. Chlu, G. M. Shleh, C. M. Wai // *Environ. Sci. & Technol.* – 1994. – Vol. 28, N 5. – P. 877–881.
43. Cherry, J. A. Arsenic species as an indicator of redox conditions in ground water / J. A. Cherry, D. E. Shaikh, D. E. Tallman, R. V. Nicholson // *J. of Hydrology.* – 1979. – Vol. 43, N 1–4. – P. 373–392.
44. Chiu, V. Q. Arsenic adsorption and oxidation at manganite surfaces: 1. Method for simultaneous determination of adsorbed and dissolved arsenic species / V. Q. Chiu, J. G. Hering // *Environ. Sci. & Technol.* – 2000. – Vol. 34, N 10. – P. 2029–2034.

45. Cornell, R. M. Effect of silicate species on the transformation of ferrihydrite into goethite and hematite in alkaline media / R. M. Cornell, R. Giovanoli, P. W. Schnidder // *Clays & Clay Minerals*. – 1987. – Vol. 35, N 1. – P. 21–28.
46. Cornett, J. Arsenic transport between water and sediments / J. Cornett, L. Chant, B. Risto // *Hydrobiologia*. – 1992. – Vol. 235/236, N 1. – P. 533–544.
47. Cox, C. D. Surface complexation of methylated arsenates by hydrous oxides / C. D. Cox, M. M. Ghosh // *Water Research*. – 1994. – Vol. 28, N 5. – P. 1181–1188.
48. Cullen, W. R. Arsenic speciation in the environment / W. R. Cullen, K. J. Reimer // *Chemical Rev.* – 1989. – Vol. 89, N 4. – P. 713–764.
49. Cummings, D. E. Arsenic mobilization by the dissimilatory Fe(III)-reducing bacterium *Shewanella alga* BrY / D. E. Cummings, F. Caccavo, Jr., S. Fendorf, R. F. Rosenzweig // *Environ. Sci. & Technol.* – 1999. – Vol. 33, N 5. – P. 723–729.
50. Darland, J. E. Effects of pH and phosphate competition on the transport of arsenate / J. E. Darland, W. P. Inskeep // *J. of Environ. Quality*. – 1997 – Vol. 26, N 4. – P. 1133–1139.
51. Darland, J. E. Effects of pore water velocity on the transport of arsenate / J. E. Darland, W. P. Inskeep // *Environ. Sci. & Technol.* – 1997 – Vol. 31, N 3. – P. 704–709.
52. Davis, C. C. Implications of aqueous silica sorption to iron hydroxide: Mobilization of iron colloids and interference with sorption of arsenate and humic substances / C. C. Davis, W. R. Knocke, M. Edwards // *Environ. Sci. & Technol.* – 2001. – Vol. 35, N 15. – P. 3158–3162.
53. Davis, J. A. Sorption and coprecipitation of arsenate by ferrihydrite / J. A. Davis, C. C. Fuller, B. A. Rea, R. G. Claypool-Frey // *Water–Rock Interaction. WRI-6: Proceedings of the 6th International Symposium on Water–Rock Interaction, Malvern, 3–8 August 1989* / D.L. Miles (ed.). – Rotterdam, Holland : A.A. Balkema, 1989. – P. 187–189. – no [30].
54. Davis, J. A. Surface complexation modeling in aqueous geochemistry / J. A. Davis, D. B. Kent // M. F. Hochella, A. F. White, eds., *Mineral-Water Interface Geochemistry*. – Washington, DC: Mineralogical Society of America, 1990. – P. 177–248. – no [80, 230].
55. De Brouwere, K. Soil properties affecting solid–liquid distribution of As(V) in soils / K. De Brouwere, E. Smolders, R. Merckx // *European J. of Soil Sci.* – 2004. – Vol. 55, N 1. – P. 165–173.
56. De Groot, A. C. Heavy Metals in Dutch Field Soils: an Experimental and Theoretical Study on Equilibrium Partitioning: Report № 607220 001 / A. C. De Groot, W. J. G. M. Peijnenburg, M. A. G. T. van den Hoop, R. Ritsema, R. P. M. van Veen; National Institute of Public Health and the Environment (RIVM). – Bilthoven, The Netherlands, 1998. – no [55].
57. De Vitre, R. Speciation and adsorption of arsenic on diagenetic iron oxyhydroxides / R. De Vitre, N. Belzile, A. Tessier // *Limnology & Oceanography*. – 1991. – Vol. 36, N 7. – P. 1480–1485.
58. Decker, D. L. Arsenate and arsenite sorption on carbonate hosted precious metals ore / D. L. Decker, C. Papelis, S. W. Tyler, M. J. Logsdon, J. Simunek // *Vadose Zone J.* – 2006. – Vol. 5, N 1. – P. 419–429.
59. Di Toro, D. M. Effects of nonreversibility, particle concentration, and ionic strength on heavy metal sorption / D. M. Di Toro, J. D. Mahony, P. R. Kirchner, A. L. O'Byrne, L. R. Pasquale, D. C. Piccirilli // *Environ. Sci. & Technol.* – 1986. – Vol. 20, N 1. – P. 55–61.

60. Diamond, M. L. A model of the exchange of inorganic chemicals between water and sediments / M. L. Diamond, D. Mackay, R. J. Cornett & L. A. Chant // *Environ. Sci. & Technol.* – 1990. – Vol. 24, N 5. – P. 713–721.
61. Dove, P. M. The solubility and stability of scorodite,  $\text{FeAsO}_4 \cdot 2\text{H}_2\text{O}$  / P. M. Dove, J. D. Rimstidt // *American Mineralogist.* – 1985. – Vol. 70, N 7–8. – P. 838–844.
62. Driehaus, W. Oxidation of arsenate(III) with manganese oxides in water-treatment / W. Driehaus, R. Seith, M. Jekel // *Water Research.* – 1995. – Vol. 29, N 1. – P. 297–305.
63. Driehaus, W. Granular ferric hydroxide – a new adsorbent for the removal of arsenic from natural water / W. Driehaus, M. Jekel, U. Hildebrandt // *J. of Water Supply: Research & Technology – AQUA.* – 1998. – Vol. 47, N 1. – P. 30–35. – no [223].
64. Dzombak, D. A. Surface Complexation Modelling: Hydrous Ferric Oxide / D. A. Dzombak, F. M. M. Morel. – N. Y. : John Wiley & Sons, 1990. – 393 p. – no [26, 30, 41, 80, 143, 224, 230, 270].
65. Eary, L. E. Rates of inorganic oxidation reactions involving dissolved oxygen / L. E. Eary, J. A. Schramke // D. C. Melchior, R. L. Bassett, eds. *Chemical Modeling of Aqueous Systems II: American Chemical Society Symposium 416.* – Washington, DC : ACS, 1990. – P. 379–396. – no [230].
66. Elkhatib, E. A. Kinetics of arsenite sorption in soils / E. A. Elkhatib, O. L. Bennett, R. J. Wright // *Soil Sci. Society of America J.* – 1984. – Vol. 48, N 4. – P. 758–762.
67. Elkhatib, E. A. Arsenite sorption and desorption in soils / E. A. Elkhatib, O. L. Bennett, R. J. Wright // *Soil Sci. Society of America J.* – 1984. – Vol. 48, N 5. – P. 1025–1030.
68. Essington, M. E. Solubility of barium arsenate // *Soil Sci. Society of America J.* – 1988. – Vol. 52, N 6. – P. 1566–1570.
69. Evangelou, V. P. Potential role of bicarbonate during pyrite oxidation / V. P. Evangelou, A. K. Seta, A. Holt // *Environ. Sci. & Technol.* – 1998. – Vol. 32, N 14. – P. 2084–2091.
70. Fendorf, S. Arsenate and chromate retention mechanisms on goethite. 1. Surface structure / S. Fendorf, M. J. Eick, P. Grossl, D. L. Sparks // *Environ. Sci. & Technol.* – 1997. – Vol. 31, N 2. – P. 315–320.
71. Fendorf, S. Temporal changes in soil partitioning and bioaccessibility of arsenic, chromium, and lead / S. Fendorf, M. J. La Force, G. Li // *J. of Environ. Quality.* – 2004. – Vol. 33, N 6. – P. 2049–2055.
72. Ferguson, J. F. A review of the arsenic cycle in natural waters / J. F. Ferguson, J. Gavis // *Water Research.* – 1972. – Vol. 6, N 11. – P. 1259–1274. – no [46, 124, 230].
73. Foster, A. L. X-ray absorption fine-structure spectroscopy study of photocatalyzed, heterogeneous As(III) oxidation on kaolin and anatase / A. L. Foster, G. E. J. Brown, G. A. Parks // *Environ. Sci. & Technol.* – 1998. – Vol. 32, N 10. – P. 1444–1452.
74. Foster, A. L. Spectroscopic investigations of arsenic species in solid phases // *Arsenic in Ground Water* / A. H. Welch, K. G. Stollenwerk, ed. – Dordrecht, The Netherlands : Kluwer Academic Publishers, 2003. – Chap. 2. – P. 27–66.
75. Fox, L. E. A model for inorganic control of phosphate concentrations in river waters // *Geochimica et Cosmochimica Acta.* – 1989. – Vol. 53, N 2. – P. 417–428.
76. Fox, L. E. Phosphorus chemistry in the tidal Hudson River // *Geochimica et Cosmochimica Acta.* – 1991. – Vol. 55, N 6. – P. 1529–1538.
77. Frost, R. R. Effect of pH on adsorption of arsenic and selenium from landfill leachate by clay minerals / R. R. Frost, R. A. Griffin // *Soil Sci. Society of America J.* – 1977. – Vol. 41, N 1. – P. 53–57.

78. Fruchter, J. S. Identification of solubility-controlling solid phases in a large fly ash field lysimeter / J. S. Fruchter, D. Rai, J. M. Zachara // *Environ. Sci. & Technol.* – 1990. – Vol. 24, N 8. – P. 1173–1179.
79. Fuller, C. C. Influence of coupling of sorption and photosynthetic processes on trace element cycles in natural waters / C. C. Fuller, J. A. Davis // *Nature.* – 1989. – Vol. 340. – P. 52–54.
80. Fuller, C. C. Surface chemistry of ferrihydrite: P. 2. Kinetics of arsenate adsorption and coprecipitation / C. C. Fuller, J. A. Davis, G. A. Waychunas // *Geochimica et Cosmochimica Acta.* – 1993. – Vol. 57, №10. – P. 2271–2282.
81. Fuller, C. C. Characterization of metal adsorption variability in a sand and gravel aquifer, Cape Cod, Massachusetts, U.S.A. / C. C. Fuller, J. A. Davis, J. A. Coston, E. Dixon // *J. of Contaminant Hydrology.* – 1996. – Vol. 22, N 3–4. – P. 165–187.
82. Gao, Y. Acid base reactions, phosphate and arsenate complexation, and their competitive adsorption at the surface of goethite in 0.7 M NaCl solution / Y. Gao, A. Mucci // *Geochimica et Cosmochimica Acta.* – 2001. – Vol. 65, N 14. – P. 2361–2378.
83. Goldberg, S. Chemical modeling of arsenate adsorption on aluminum and iron oxide minerals // *Soil Sci. Society of America J.* – 1986. – Vol. 50, N 5. – P. 1154–1157.
84. Goldberg, S. Anion sorption on a calcareous, montmorillonitic soil – Arsenic / S. Goldberg, R. A. Glaubig // *Soil Sci. Society of America J.* – 1988. – Vol. 52, N 5. – P. 1297–1399.
85. Goldberg, S. The surface chemistry of aluminum oxides and hydroxides / S. Goldberg, J. A. Davis, J. D. Hem // *The Environmental Chemistry of Aluminum / G. Sposito, ed.; 2-nd ed.* – Boca Raton, FL: CRC Lewis Publishers, 1996. – Chap. 7. – P. 271–332. – no [143].
86. Goldberg, S. Mechanisms of arsenic adsorption on amorphous oxides evaluated using macroscopic measurements, vibrational spectroscopy, and surface complexation modeling / S. Goldberg, C. T. Johnston // *J. of Colloid & Interface Sci.* – 2001. – Vol. 234, N 1. – P. 204–216.
87. Goldberg, S. Competitive adsorption of arsenate and arsenite on oxides and clay minerals // *Soil Sci. Society of America J.* – 2002. – Vol. 66, N 2. – P. 413–421.
88. Goldberg, S. Predicting arsenate adsorption by soils using soil chemical parameters in the constant capacitance model / S. Goldberg, S. M. Lesch, D. L. Suarez, N. T. Basta // *Soil Sci. Society of America J.* – 2005. – Vol. 69, N 5. – P. 1389–1398.
89. Goldberg, S. Adsorption–desorption processes in subsurface reactive transport modeling / S. Goldberg, L. J. Criscenti, D. R. Turner, J. A. Davis, K. J. Cantrell // *Vadose Zone J.* – 2007. – Vol. 6, N 3. – P. 407–435.
90. Grafe, M. Adsorption of arsenate (V) and arsenite (III) on goethite in the presence and absence of dissolved organic carbon / M. Grafe, M. J. Eick, P. R. Grossl // *Soil Sci. Society of America J.* – 2001. – Vol. 65, N 6. – P. 1680–1687.
91. Grafe, M. Adsorption of arsenate and arsenite on ferrihydrite in the presence and absence of dissolved organic carbon / M. Grafe, M. J. Eick, P. R. Grossl, A. M. Saunders // *J. of Environ. Quality.* – 2002. – Vol. 31, N 4. – P. 1115–1123.
92. Grossl, P. R. Evaluation of contaminant ion adsorption/desorption on goethite using pressure-jump relaxation kinetics / P. R. Grossl, D. L. Sparks // *Geoderma.* – 1995. – Vol. 67, N 1–2. – P. 87–101.
93. Guha, S. Collection of depth-specific groundwater samples from an arsenic contaminated aquifer in West Bengal, India / S. Guha, B. C. Raymahasay, A. Banerjee, S. K. Acharyya, A. Gupta // *Environ. Engineering Sci.* – 2005. – Vol. 22, N 6. – P. 870–881.

94. Gulens, J. Influence of redox environments on the mobility of arsenic in ground water / J. Gulens, D. R. Champ, R. E. Jackson // E. A. Jenne (ed.) *Chemical Modelling in Aqueous Systems*. – Washington, DC : American Chemical Society, 1979. – P. 81–95. – no [223].
95. Gupta, S. K. Arsenic removal by adsorption / S. K. Gupta, K. Y. Chen // *J. of Water Pollution Control Federation*. – 1978. – Vol. 50, N 3. – P. 493–506.
96. Hakanson, L. *Principals of Lake Sedimentology* / L. Hakanson, M. Jansson. – N. Y. : Springer-Verlag, 1983. – 316 p. – no [46].
97. Halter, W. E. Arsenic(V) adsorption onto  $\alpha$ - $\text{Al}_2\text{O}_3$  between 25 and 70°C / W. E. Halter, H. R. Pfeifer // *Appl. Geochemistry*. – 2001. – Vol. 16, N 7–8. – P. 793–802.
98. Harrison, J. B. Anion interactions with freshly prepared hydrous oxides / J. B. Harrison, V. E. Berkheiser // *Clays & Clay Minerals*. – 1982. – Vol. 30, N 2. – P. 97–102.
99. Haury, V. Redox-induced species distribution of arsenic in a suboxic groundwater environment – column experiments / V. Haury, S. Jann, M. Kofod, C. Scholz, M. Isenbeck-Schroter // *Proceedings of the International Conference on Groundwater Research*. – Copenhagen, Denmark, 2000. – P. 197–198. – no [230].
100. He, L. M. Ionic strength effects on sulfate and phosphate adsorption on  $\gamma$ -alumina and kaolinite: Triple-layer model / L. M. He, L. W. Zelazny, V. C. Baligar, K. D. Ritchey, D. C. Martens // *Soil Sci. Society of America J.* – 1997. – Vol. 61, N 3. – P. 784–793.
101. Helz, G. R. Oligomerization in As (III) sulfide solutions: Theoretical constraints and spectroscopic evidence / G. R. Helz, J. A. Tossell, J. M. Charnock, R. A. D. Patrick, D. J. Vaughan, C. D. Garner // *Geochimica et Cosmochimica Acta*. – 1995. – Vol. 59, N 22. – P. 4591–4604.
102. Herbelin, A. L. FITEQL: A computer program for determination of chemical equilibrium constants from experimental data. Version 3.1. Report 94-01 / A. L. Herbelin, J. C. Westall. – Corvallis : Dept. of Chemistry, Oregon State Univ., 1994. – 243 p. – no [143].
103. Hering, J. G. Arsenic removal from drinking water during coagulation / J. G. Hering, C. Pen-Yuan, J. A. Wilkie, M. Elimelech // *J. of Environ. Engineering*. – 1997. – Vol. 123, N 8. – P. 800–807.
104. Hiemstra, T. Surface structural ion adsorption modeling of competitive binding of oxyanions by metal (hydr)oxides / T. Hiemstra, W. H. Van Riemsdijk // *J. of Colloid & Interface Sci.* – 1999. – Vol. 210, N 1. – P. 182–193.
105. Hiltbold, A. E.: Behavior of organoarsenicals in plants and soils // *Arsenical Pesticides (ACS Symp. Ser. 7)* / E. A. Woolson, ed. – Washington, DC : American Chemical Society, 1975. – P. 53–69. – no [210].
106. Hingston, F. J. Competitive adsorption of negatively charged ligands on oxide surfaces / F. J. Hingston, A.M. Posner, J. P. Quirk // *Discussions of the Faraday Society*. – 1971. – Vol. 52. – P. 334–342. – no [50, 165, 210, 223, 230].
107. Hingston, F. J. Anion adsorption by goethite and gibbsite: I. The role of the proton in determining adsorption envelopes / F. J. Hingston, A. M. Posner, J. P. Quirk // *J. of Soil Sci.* – 1972. – Vol. 23, N 2. – P. 177–192. – no [30, 206, 230].
108. Hingston, F. J. Anion adsorption by goethite and gibbsite. II. Desorption of anions from hydrous oxide surfaces / F. J. Hingston, A. M. Posner, J. P. Quirk // *J. of Soil Sci.* – 1974. – Vol. 25, N 1. – P. 16–26.
109. Hingston, F. J. A review of anion adsorption // M. A. Anderson, A. J. Rubin, eds. *Adsorption of Inorganics at Solid-Liquid Interface*. – Ann Arbor, USA : Ann Arbor Science Publication, 1981. – P. 51–90. – no [66, 210].

110. Hsia, T. H. As(V) adsorption on amorphous iron oxide: Triple layer modelling / T. H. Hsia, S. L. Lo, C. F. Lin // *Chemosphere*. – 1992. – Vol. 25, N 12. – P. 1825–1837.
111. Hsia, T.-H. Characterization of arsenate adsorption on hydrous iron oxide using chemical and physical methods / T.-H. Hsia, S.-L. Lo, C.-F. Lin, D.-Y. Lee // *Colloids & Surfaces A – Physicochemical & Engineering Aspects*. – 1994. – Vol. 85, N 1. – P. 1–7.
112. Huang, P. M. Retention of arsenic by hydroxy-aluminum on surfaces of micaceous mineral colloids // *Soil Sci. Society of America Proceedings*. – 1975. – Vol. 39, N 2. – P. 271–274.
113. Jackson, B. P. Effectiveness of phosphate and hydroxide for desorption of arsenic and selenium species from iron oxides / B. P. Jackson, W. P. Miller // *Soil Sci. Society of America J.* – 2000. – Vol. 64, N 5. – P. 1616–1622.
114. Jain, A. Arsenite and arsenate adsorption on ferrihydrite: Surface charge reduction and net OH<sup>-</sup> release stoichiometry / A. Jain, K. P. Raven, R. H. Loeppert // *Environ. Sci. & Technol.* – 1999. – Vol. 33, N 8. – P. 1179–1184.
115. Jain, A. Effect of competing anions on the adsorption of arsenate and arsenite by ferrihydrite / A. Jain, R. H. Loeppert // *J. of Environ. Quality*. – 2000. – Vol. 29, N 5. – P. 1422–1430.
116. Janssen, R. P. T. Equilibrium partitioning of heavy metals in Dutch field soils. I. Relationship between metal partition coefficients and soil characteristics / R. P. T. Janssen, W. J. G. M. Peijnenburg, L. Posthuma, M. A. G. T. van den Hoop // *Environ. Toxicology & Chemistry*. – 1997. – Vol. 16, N 12. – P. 2470–2478.
117. Jia, Y. F. Observation of surface precipitation of arsenate on ferrihydrite / Y. F. Jia, L. Xu, Z. Fang, G. P. Demopoulos // *Environ. Science & Technol.* – 2006. – Vol. 40, N 10. – P. 3248–3253.
118. Jones, C. A. Rates of microbially mediated arsenate reduction and solubilization / C. A. Jones, H. W. Langner, K. Anderson, T. R. McDermott, W. P. Inskeep // *Soil Sci. Society of America J.* – 2000. – Vol. 64, N 2. – P. 600–608.
119. Keren, R. pH-dependent boron adsorption by Na-montmorillonite / R. Keren, R. G. Gast, B. Bar-Yosef // *Soil Sci. Society of America J.* – 1981. – Vol. 45, N 1. – P. 45–48.
120. Keren, R. Errata: pH-dependent boron adsorption by Na-montmorillonite / R. Keren, R.G. Gast, B. Bar-Yosef // *Soil Sci. Society of America J.* – 1981. – Vol. 45, N 5. – P. 1006.
121. Kim, M.-J. Carbonate ions and arsenic dissolution by groundwater / M.-J. Kim, J. Nriagu, S. Haack // *Environ. Sci. & Technol.* – 2000. – Vol. 34, N 15. – P. 3094–3100.
122. Kinniburgh, D. G. The scale and causes of the groundwater arsenic problem in Bangladesh / D. G. Kinniburgh, P. L. Smedley, J. Davies, C. J. Milne [et al.] // *Arsenic in Ground Water* / ed. A. H. Welch, K. G. Stollenwerk. – Dordrecht, The Netherlands : Kluwer Academic Publishers, 2003. – Chap. 8. – P. 211–257.
123. Kinniburgh, D. G. Predominance and mineral stability diagrams revisited / D. G. Kinniburgh, D. M. Cooper // *Environ. Sci. & Technol.* – 2004. – Vol. 38, N 13. – P. 3641–3648.
124. Korte, N. E. A review of arsenic(III) in groundwater / N. E. Korte, Q. Fernando // *Critical Rev. Environ. Control*. – 1991. – Vol. 21, N 1. – P. 1–39.
125. Kuhlmeier, P. D. Partitioning of arsenic species in fine-grained soils // *J. of Air & Waste Management Association*. – 1997. – Vol. 47, N 4. – P. 481–490.



126. Kuhlmeier, P. D. Sorption and desorption of arsenic from sandy soils: Column studies // *Soil & Sediment Contamination*. – 1997. – Vol. 6, N 1. – P. 21–36.
127. Ladeira, A. C. Q. Mechanism of anion retention from EXAFS and density functional calculations: Arsenic(V) adsorbed on gibbsite / A. C. Q. Ladeira, V. S. T. Ciminelli, H. A. Duarte, M. C. M. Alves, A. Y. Ramos // *Geochimica et Cosmochimica Acta*. – 2001. – Vol. 65, N 8. – P. 1211–1217.
128. Langner, H. W. Microbial reduction of arsenate in the presence of ferrihydrite / H. W. Langner, W. P. Inskeep // *Environ. Sci. & Technol.* – 2000. – Vol. 34, N 15. – P. 3131–3136.
129. Laverman, A. M. Growth of strain SES-3 with arsenate and other diverse electron acceptors / A. M. Laverman, J. S. Blum, J. K. Schaefer, E. J. P. Phillips, D. R. Lovley, R. S. Oremland // *Appl. & Environ. Microbiology*. – 1995. – Vol. 61, N 10. – P. 3556–3561.
130. Laxen, D. P. H. Trace metal adsorption/coprecipitation on hydrous ferric oxide under realistic conditions // *Water Research*. – 1985. – Vol. 19, N 10. – P. 1229–1236.
131. Lázaro, I. Electrochemical study of orpiment ( $As_2S_3$ ) and realgar ( $As_2S_2$ ) in acidic medium / I. Lázaro, I. González, R. Cruz, M. G. Monrov // *J. of the Electrochemical Society*. – 1997. – Vol. 144, N 12. – P. 4128–4132.
132. Lenhart, J. J. Arsenic binding by natural organic matter: Interim report for 2003OH5B: The effect of humic and fulvic acids on arsenic solubility in drinking water supplies / J. J. Lenhart, Y. Yang // *Articles in Refereed Scientific Journals*. – 2004. – Manuscript in preparation for *Applied Geochemistry*.
133. Lide, D. R. *Handbook of Chemistry and Physics*: 80th ed. – Boca Raton, FL: CRC Press Inc., 1999–2000. – no [121].
134. Lin, Z. Adsorption, desorption and oxidation of arsenic affected by clay minerals and aging process / Z. Lin, R. W. Puls // *Environ. Geology*. – 2000. – Vol. 39, N 7. – P. 753–759.
135. Lindsay, W. L. *Chemical Equilibria in Soils*. – N. Y. : John Wiley & Sons, 1979. – 449 p. – no [149, 210].
136. Livesey, N. T. Adsorption of arsenate by soils and its relation to selected chemical properties and anions / N. T. Livesey, P. M. Huang // *Soil Sci.* – 1981. – Vol. 131, N 2. – P. 88–94.
137. Lombi, E. Arsenic adsorption by soils and iron-oxide-coated sand: Kinetics and reversibility / E. Lombi, W. W. Wenzel, R. S. Sletten // *J. of Plant Nutrition & Soil Sci.* – 1999. – Vol. 162, N 4. – P. 451–456.
138. Looney, B. B. Estimating of Geochemical Parameters for Assessing Subsurface Transport at the Savannah River Plant: DPST-85-904, Environmental Information Document / B. B. Looney, M. W. Grant, C. M. King ; E. I. du pont de Nemours and Company, Savannah River Laboratory. – Aiken, South Carolina, 1987. – no [30].
139. Lumsdon, D. G. Use of soil phase characterization and chemical modelling for assessing the behavior of arsenic in contaminated soils / D. G. Lumsdon, J. C. L. Meeussen, E. Paterson, L. M. Garden, P. Anderson // *Appl. Geochemistry*. – 2001. – Vol. 16, N 6. – P. 571–581.
140. Luxton, T. P. Mobilization of arsenite by competitive interaction with silicic acid / T. P. Luxton, C. J. Tadanier, M. J. Eick // *Soil Sci. Society of America J.* – 2006. – Vol. 70, N 1. – P. 204–214.
141. Manning, B. A. Modeling arsenate competitive adsorption on kaolinite, montmorillonite and illite / B. A. Manning, S. Goldberg // *Clays & Clay Minerals*. – 1996. – Vol. 44, N 5. – P. 609–623.

142. Manning, B. A. Modeling competitive adsorption of arsenate with phosphate and molybdate on oxide minerals / B. A. Manning, S. Goldberg // *Soil Sci. Society of America J.* – 1996. – Vol. 60, N 1. – P. 121–131.
143. Manning, B. A. Adsorption and stability of arsenic(III) at the clay mineral–water interface / B. A. Manning, S. Goldberg // *Environ. Sci. & Technol.* – 1997. – Vol. 31, N 7. – P. 2005–2011.
144. Manning, B. A. Arsenic(III) and arsenic(V) adsorption on three California soils / B. A. Manning, S. Goldberg // *Soil Sci.* – 1997. – Vol. 162, N 12. – P. 886–895.
145. Manning B.A., Fendorf S.E., Goldberg S. Surface structures and stability of arsenic(III) on goethite: spectroscopic evidence for inner-sphere complexes / B. A. Manning, S. E. Fendorf, S. Goldberg // *Environ. Sci. & Technol.* – 1998. – Vol. 32, N 16. – P. 2383–2388.
146. Manning, B. A. Modeling arsenic(III) adsorption and heterogeneous oxidation kinetics in soils / B. A. Manning, D. L. Suarez // *Soil Sci. Society of America J.* – 2000. – Vol. 64, N 1. – P. 128–137.
147. Mariner, P. E. Effects of high pH on arsenic mobility in a shallow sandy aquifer and on aquifer permeability along the adjacent shoreline, Commencement Bay Superfund site, Tacoma, Washington / P. E. Mariner, F. J. Holzmer, R. E. Jackson, H. W. Meinardus, F. G. Wolf // *Environ. Sci. & Technol.* – 1996. – Vol. 30, N 5. – P. 1645–1651.
148. Marten, R. R. X-ray photoelectron studies of anion adsorption on goethite / R. R. Marten, R. C. Smart // *Soil Sci. Society of America J.* – 1987. – Vol. 51, N 1. – P. 54–56.
149. Masscheleyn, P. H. Effect of redox potential and pH on arsenic speciation and solubility in a contaminant soil / P. H. Masscheleyn, R. D. Delaune, W. H. Patrick, Jr. // *Environ. Sci. & Technol.* – 1991. – Vol. 25, N 8. – P. 1414–1419.
150. Matis, K. A. Sorption of As(V) by goethite particles and study of their flocculation / K. A. Matis, A. I. Zouboulis, A. V. Valtadorou // *Water, Air, & Soil Pollution.* – 1999. – Vol. 111, №1–4. – P. 297–316.
151. McBride, M. B. *Environmental Chemistry of Soils.* – N. Y. : Oxford Univ. Press, 1994. – 406 p. – no [176].
152. McCreadie, H. Influence of reduction reactions and solid-phase composition on porewater concentrations of arsenic / H. McCreadie, D. W. Blowes, C. J. Ptacek, J. L. Jambor // *Environ. Sci. & Technol.* – 2000. – Vol. 34, N 15. – P. 3159–3166.
153. McGeehan, S. L. Statistical evaluation of arsenic adsorption data using linear-plateau regression analysis / S. L. McGeehan, D. V. Naylor, B. Shafii // *Soil Sci. Society of America J.* – 1992. – Vol. 56, N 4. – P. 1130–1133.
154. McGeehan, S. L. Alteration of As sorption in flooded-dried soils / S. L. McGeehan, S. E. Fendorf, D. V. Naylor // *Soil Sci. Society of America J.* – 1998. – Vol. 62, N 3. – P. 828–833.
155. McKnight, D. M. Iron photoreduction and oxidation in an acidic mountain stream / D. M. McKnight, B. A. Kimball, K. E. Bencala // *Sci.* – 1988. – Vol. 240. – P. 637–640.
156. McKnight, D. M. Reactive iron transport in an acidic mountain stream in Summit County, Colorado: A hydrologic perspective / D. M. McKnight, K. E. Bencala // *Geochimica et Cosmochimica Acta.* – 1989. – Vol. 53, N 9. – P. 2225–2234.
157. McLaren, R. G. Fractionation and distribution of arsenic in soils contaminated by cattle dip / R. G. McLaren, R. Naidu, J. Smith, K. G. Tiller // *J. of Environ. Quality.* – 1998. – Vol. 27, N 2. – P. 348–354.

158. Melamed, R. Effect of adsorbed phosphate on transport of arsenate through an oxisol / R. Melamed, J. J. Jurinak, L. M. Dudley // *Soil Sci. Society of America J.* – 1995. – Vol. 59, N 5. – P. 1289–1294.
159. Meng, X. Effects of silicate, sulfate, and carbonate on arsenic removal by ferric chloride / X. Meng, S. Bang, G. P. Korfiatis // *Water Research.* – 2000. – Vol. 34, N 4. – P. 1255–1261.
160. Mok, W. M. Arsenic speciation and quality of groundwater in a lead-zinc mine, Idaho / W. M. Mok, J. A. Riley, C.M. Wai // *Water Research.* – 1988. – Vol. 22, N 6. – P. 769–774.
161. Mok, W. M. Distribution and mobilization of arsenic and antimony species in the Coeur D'Alene River, Idaho / W. M. Mok, C. M. Wai // *Environ. Sci. & Technol.* – 1990. – Vol. 24, N 1. – P. 102–108.
162. Moore, J. N. Partitioning of arsenic and metals in reducing sulfidic sediments / J. N. Moore, W. H. Ficklin, C. Johns // *Environ. Sci. & Technol.* – 1988. – Vol. 22, N 4. – P. 432–437.
163. Moore, J. N. Reaction scheme for the oxidation of As(III) to As(V) by birnessite / J. N. Moore, J. R. Walker, T. H. Hayes // *Clays & Clay Minerals.* – 1990. – Vol. 38, N 5. – P. 549–555.
164. Murali, V. Competitive adsorption during solute transport in soils: 2. Simulations of competitive adsorption / V. Murali, L. A. G. Aylmore // *Soil Sci.* – 1983. – Vol. 135, N 4. – P. 203–213.
165. Murali, V. Competitive adsorption during solute transport in soils. 3. A review of experimental evidence of competitive adsorption and an evaluation of simple competition models / V. Murali, L. A. G. Aylmore // *Soil Sci.* – 1983. – Vol. 136, N 5. – P. 279–290.
166. Myneni, S. C. B. Oxyanion behavior in alkaline environments: Sorption and desorption of arsenate in ettringite / S. C. B. Myneni, S. J. Traina, T. J. Logan, G. A. Waychunas // *Environ. Sci. & Technol.* – 1997. – Vol. 31, N 6. – P. 1761–1768.
167. Naidu, R. Cadmium sorption and transport in variable charge soils: A review / R. Naidu, R. S. Kookana, M. E. Sumner, R. D. Harter, K. G. Tillier // *J. of Environ. Quality.* – 1997. – Vol. 26, N 3. – P. 602–617.
168. Nicholson, R. V. Pyrite oxidation in carbonate-buffered solution: 2. Rate control by oxide coatings / R. V. Nicholson, R. W. Gillham, E. J. Reardon // *Geochimica et Cosmochimica Acta.* – 1990. – Vol. 54, N 2. – P. 395–402.
169. Nickson, R. Arsenic poisoning of Bangladesh groundwater / R. Nickson, J. McArthur, W. Burgess, K. M. Ahmed, P. Ravenscroft, M. Rahman // *Nature.* – 1998. – Vol. 395. – P. 338.
170. Nickson, R. T. Mechanism of arsenic release to groundwater, Bangladesh and West Bengal / R. T. Nickson, J. M. McArthur, P. Ravenscroft, W. G. Burgess, K. M. Ahmed // *Appl. Geochemistry.* – 2000. – Vol. 15, N 4. – P. 403–413.
171. Nordstrom, D. K. Arsenic thermodynamic data and environmental geochemistry. An evaluation of thermodynamic data for modeling the aqueous environmental geochemistry of arsenic / D. K. Nordstrom, D. G. Archer // *Arsenic in Ground water* / ed. A. H. Welch, K. G. Stollenwerk. – Dordrecht, The Netherlands : Kluwer Academic Publishers, 2003. – Chap. 1. – P. 1–25.
172. Nriagu, J. O. Arsenic enrichment in the lakes near the smelters at Sudbury, Ontario // *Geochimica et Cosmochimica Acta.* – 1983. – Vol. 47, N 8. – P. 1523–1526.
173. Nyffeler, U. P. The relevance of sorption kinetics to modelling of sediment–water interactions in natural waters / U. P. Nyffeler, P. H. Santschi, Y.-H. Li // *Limnology & Oceanography.* – 1986. – Vol. 31, N 2. – P. 277–292.

174. O'Connor, D. J. The effect of concentration of adsorbing solids on the partition coefficient / D. J. O'Connor, J. P. Connolly // *Water Research*. – 1980. – Vol. 14, N 10. – P. 1517–1523.
175. O'Melia, C. R. Particle–particle interactions // *Aquatic Surface Chemistry* / W. Stumm, ed. – N. Y. : John Wiley & Sons, 1987. – P. 385–403. – no [80].
176. O'Reilly, S. E. Residence time effects on arsenate adsorption/desorption mechanisms on goethite / S. E. O'Reilly, D. G. Strawn, D. L. Sparks // *Soil Sci. Society of America J.* – 2001. – Vol. 65, N 1. – P. 67–77.
177. Oscarson, D. W. The oxidation of arsenite by aquatic sediments / D. W. Oscarson, P. M. Huang, W. K. Liaw // *J. of Environ. Quality*. – 1980. – Vol. 9, N 4. – P. 700–703.
178. Oscarson, D. W. Oxidative power of Mn(IV) and Fe(III) oxides with respect to As(III) in terrestrial and aquatic environments / D. W. Oscarson, P. M. Huang, C. Defosse, A. Herbillon // *Nature*. – 1981. – Vol. 291. – P. 50–51.
179. Oscarson, D. W. Role of manganese in the oxidation of arsenite by freshwater lake sediments / D. W. Oscarson, P. M. Huang, W. K. Liaw // *Clays & Clay Minerals*. – 1981. – Vol. 29, N 3. – P. 219–225.
180. Oscarson, D. W. Kinetics of oxidation of arsenite by various manganese dioxides / D. W. Oscarson, P. M. Huang, W. K. Liaw, U. T. Hammer // *Soil Sci. Society of America J.* – 1983. – Vol. 47, N 4. – P. 644–648.
181. Pansar-Kallio, M. Speciation of mobile arsenic in soil samples as a function of pH / M. Pansar-Kallio, P. K. G. Manninen // *Sci. of the Total Environ.* – 1997. – Vol. 204, N 2. – P. 193–200.
182. Parfitt, R. L. Adsorption on hydrous oxides: 4. Mechanisms of adsorption of various ions on goethite / R. L. Parfitt, J. O. Russell // *J. of Soil Sci.* – 1977. – Vol. 28, N 2. – P. 297–305.
183. Parfitt, R. L. Infrared spectra from binuclear bridging complexes of sulfate adsorbed on goethite ( $\alpha$ -FeOOH) / R. L. Parfitt, R. C. Smart // *J. of the Chemical Society, Faraday Transactions 1: Physical Chemistry in Condensed Phases*. – 1977. – Vol. 73. – P. 796–802.
184. Parfitt, R. L. Anion adsorption by soils and soil materials // *Advances in Agronomy*. – 1979. – Vol. 30. – P. 1–50. – no [206, 210].
185. Parkhurst, D. L. User's guide to PHREEQC (Version 2) – A computer program for speciation, batch-reaction, one-dimensional transport, and inverse geochemical calculations / D. L. Parkhurst, C. A. J. Appelo // *Water-Resources Investigations Report 99-4259*. – USGS, 1999. – no [224].
186. Peak, J. D. An in situ ATR-FTIR investigation of sulfate bonding mechanisms on goethite / J. D. Peak, D. L. Sparks, R. G. Ford // *J. of Colloid & Interface Sci.* – 1999. – Vol. 218, N 1. – P. 289–299.
187. Pedersen, H. D. Release of arsenic associated with the reduction and transformation of iron oxides / H. D. Pedersen, D. Postma, R. Jakobsen // *Geochimica et Cosmochimica Acta*. – 2006. – Vol. 70, N 16. – P. 4116–4129.
188. Persson, P. Structure and bonding of orthophosphate ions at the iron oxide–aqueous interface / P. Persson, N. Nilsson, S. Sjöberg // *J. of Colloid & Interface Sci.* – 1996. – Vol. 177, N 1. – P. 263–275.
189. Peryea, F. J. Phosphate-induced release of arsenic from soils contaminated with lead arsenate // *Soil Sci. Society of America J.* – 1991. – Vol. 55, N 5. – P. 1301–1306.
190. Peterson, M. L. Arsenic distributions in porewaters and sediments of Puget Sound, Lake Washington, the Washington coast and Sannich Inlet, B. C. / M. L. Peterson,

- R. Carpenter // *Geochimica et Cosmochimica Acta*. – 1986. – Vol. 50, N 3. – P. 353–369.
191. Pierce, M. L. Adsorption of arsenite on amorphous iron hydroxide from dilute aqueous solution / M. L. Pierce, C. B. Moore // *Environ. Sci. & Technol.* – 1980. – Vol. 14, N 2. – P. 214–216.
  192. Pierce, M. L. Adsorption of arsenite and arsenate on amorphous iron hydroxide / M. L. Pierce, C. B. Moore // *Water Research*. – 1982. – Vol. 16, N 7. – P. 1247–1253.
  193. Pigna, M. Kinetics of arsenate sorption–desorption from metal oxides: Effect of residence time / M. Pigna, G. S. R. Krishnamurti, A. Violante // *Soil Sci. Society of America J.* – 2006. – Vol. 70, N 6. – P. 2017–2027.
  194. Polemio, M. Minor elements in south-east Italy soils / M. Polemio, S.A. Bufo, N. Senesi // *Plant & Soil*. – 1982. – Vol. 69, N 1. – P. 57–66.
  195. Polizzotto, M. L. Solid-phases and desorption processes of arsenic within Bangladesh sediments / M. L. Polizzotto, C. F. Harvey, G. C. Li, B. Badruzzman, A. Ali, M. Newville, S. Sutton, S. Fendorf // *Chem. Geology*. – 2006. – Vol. 228, N 1–3. – P. 97–111.
  196. Puls, R. W. Transport of inorganic colloids through natural aquifer material: Implications for contaminant transport / R. W. Puls, R. M. Powell // *Environ. Sci. & Technol.* – 1992. – Vol. 26, N 3. – P. 614–621.
  197. Quaghebeur, M. Desorption kinetics of arsenate from kaolinite as influenced by pH / M. Quaghebeur, A. Rate, Z. Rengel, C. Hinz // *J. of Environ. Quality*. – 2005. – Vol. 34, N 2. – P. 479–486.
  198. Radu, T. Effects of dissolved carbonate on arsenic adsorption and mobility / T. Radu, J. L. Subacz, J. M. Phillippi, M. O. Barnett // *Environ. Sci. & Technol.* – 2005. – Vol. 39, N 20. – P. 7875–7882.
  199. Raven, K. P. Arsenite and arsenate adsorption on ferrihydrite: Kinetics, equilibrium, and adsorption envelopes / K. P. Raven, A. Jain, R. H. Loeppert // *Environ. Sci. & Technol.* – 1998. – Vol. 32, N 3. – P. 344–349.
  200. Redman, A. D. Natural organic matter affects arsenic speciation and sorption onto hematite / A. D. Redman, D. L. Macalady, D. Ahmann // *Environ. Sci. & Technol.* – 2002. – Vol. 36, N 13. – P. 2889–2896.
  201. Reynolds, J. G. Arsenic sorption in phosphate-amended soils during flooding and subsequent aeration / J. G. Reynolds, D. V. Naylor, S. E. Fendorf // *Soil Sci. Society of America J.* – 1999. – Vol. 63, N 5. – P. 1149–1156.
  202. Robins, R. G. Solubility and stability of scorodite,  $\text{FeAsO}_4 \cdot 2\text{H}_2\text{O}$ : Discussion // *American Mineralogist*. – 1987. – Vol. 72, N 7–8. – P. 842–844.
  203. Rochette, E. A. Stability of arsenate minerals in soil under biotically generated reducing conditions / E. A. Rochette, G. C. Li, S. E. Fendorf // *Soil Sci. Society of America J.* – 1998. – Vol. 62, N 6. – P. 1530–1537.
  204. Rochette, E. A. Kinetics of arsenate reduction by dissolved sulfide / E. A. Rochette, B. C. Bostick, G. C. Li, S. E. Fendorf // *Environ. Sci. & Technol.* – 2000. – Vol. 34, N 22. – P. 4714–4720.
  205. Roy, W. R. Competitive coefficients for the adsorption of arsenate, molybdate, and phosphate mixtures by soils / W. R. Roy, J. J. Hassett, R. A. Griffin // *Soil Sci. Society of America J.* – 1986. – Vol. 50, N 5. – P. 1176–1182.
  206. Roy, W. R. Competitive interactions of phosphate and molybdate on arsenate adsorption / W. R. Roy, J. J. Hassett, R. A. Griffin // *Soil Sci.* – 1986. – Vol. 142, N 4. – P. 203–210.

207. Ryden, J. C. Inorganic anion sorption and interactions with phosphate sorption by hydrous ferric oxide gel / J. C. Ryden, J. K. Syers, R. W. Tillman // *J. of Soil Sci.* – 1987. – Vol. 38, N 2. – P. 211–217.
208. Sadiq, M. Environmental behavior of arsenic in soils: Theoretical / M. Sadiq, T. H. Zaida, A. A. Mian // *Water, Air, & Soil Pollution.* – 1983. – Vol. 20, N 4. – P. 369–377.
209. Sadiq, M. *Toxic Metal Chemistry in Marine Environments.* – N. Y. : Marcel Dekker Inc., 1992. – 374 p. – no [210].
210. Sadiq, M. Arsenic chemistry in soils: An overview of thermodynamic predictions and field observations // *Water, Air, & Soil Pollution.* – 1997. – Vol. 93, N 1–4. – P. 117–136.
211. Sakata, M. Relationship between adsorption of arsenic(III) and boron by soil and soil properties // *Environ. Sci. & Technol.* – 1987. – Vol. 21, N 11. – P. 1126–1130.
212. Santschi, P. H. Estimates of the resistance to chemical transport posed by the deep-sea boundary layer / P. H. Santschi, P. Bower, U. P. Nyffeler, A. Azevedo, W. Broecker // *Limnology & Oceanography.* – 1983. – Vol. 28, N 5. – P. 899–912. – no [46].
213. Schaufelberger, F. A. Arsenic minerals formed at low temperatures // *Arsenic in the Environment P. I: Cycling and Characterization* / J. O. Nriagu, ed. – N. Y. : John Wiley & Sons, 1994. – P. 403–415. – no [121].
214. Schreiber, M. E. Stratigraphic and geochemical controls on naturally occurring arsenic in groundwater, Eastern Wisconsin, USA / M. E. Schreiber, J. A. Simo, P. G. Freiberg // *Hydrogeology J.* – 2000. – Vol. 8, N 2. – P. 161–176.
215. Scott, M. J. Reactions at oxide surfaces. 1. Oxidation of As(III) by synthetic birnessite / M. J. Scott, J. J. Morgan // *Environ. Sci. & Technol.* – 1995. – Vol. 29, N 8. – P. 1898–1905.
216. Selim, H. M. Modeling the transport of heavy metals in soils: CRREL Monogr. 90-2 / H. M. Selim, M. C. Amacher, I. K. Iskandar. – Hanover, NH : U. S. Army Cold Reg. Res. Eng. Lab., 1990. – no [270].
217. Seyler, P. Biogeochemical processes affecting arsenic species distribution in a permanently stratified lake / P. Seyler, J.-M. Martin // *Environ. Sci. & Technol.* – 1989. – Vol. 23, N 10. – P. 1258–1263.
218. Sheindorf, C. A Freundlich-type multicomponent isotherm / C. Sheindorf, M. Rebhun, M. Sheintuch // *J. of Colloid & Interface Sci.* – 1981. – Vol. 79, N 1. – P. 136–142.
219. Sheindorf, C. Organic pollutants adsorption from multicomponent systems modeled by Freundlich type isotherm / C. Sheindorf, M. Rebhun, M. Sheintuch // *Water Research.* – 1982. – Vol. 16, N 3. – P. 357–362.
220. Siami, M. Arsenic sedimentation along the slope of a lake basin / M. Siami, C. D. McNabb, T. R. Batterson, R. P. Glandon // *Environ. Toxicology & Chemistry.* – 1987. – Vol. 6, N 8. – P. 595–605.
221. Simon, G. Oxidation state of gold and arsenic in gold-bearing arsenian pyrite / G. Simon, H. Huang, J. E. Penner-Hahn, S. E. Kesler, L. S. Kao // *American Mineralogist.* – 1999. – Vol. 84, N 7–8. – P. 1071–1079.
222. Singh, D. B. As(III) removal from aqueous solution by adsorption / D. B. Singh, G. Prasad, D. C. Rupainwar, V. N. Singh // *Water, Air & Soil Pollution.* – 1988. – Vol. 42, N 3–4. – P. 373–386.
223. Smedley, P. L. A review of the source, behaviour and distribution of arsenic in natural waters / P. L. Smedley, D. G. Kinniburgh // *Appl. Geochemistry.* – 2002. – Vol. 17, N 5. – P. 517–568.

224. Smedley, P. L. Sources and distribution of arsenic in groundwater and aquifers // *Arsenic in Groundwater: A World Problem: Seminar Utrecht 29 November 2006* / ed. T. Appelo. – Netherlands National Committee of the IAH, 2008. – P. 4–32. – URL: [http://www.igrac.net/dynamics/modules/SFIL0100/view.php?fil\\_Id=107](http://www.igrac.net/dynamics/modules/SFIL0100/view.php?fil_Id=107)
225. Smith, E. Chemistry of arsenic in soils. I. Sorption of arsenate and arsenite by four Australian soils / E. Smith, R. Naidu, A. M. Alston // *J. of Environ. Quality*. – 1999. – Vol. 28, N 6. – P. 1719–1726.
226. Smith, E. Chemistry of inorganic arsenic in soils: II. Effect of phosphorus, sodium, and calcium on arsenic sorption / E. Smith, R. Naidu, A. M. Alston // *J. of Environ. Quality*. – 2002. – Vol. 31, N 2. – P. 557–563.
227. Sposito, G. *The Surface Chemistry of Soils*. – N. Y. : Oxford University Press, 1984. – 234 p. – no [230].
228. Sposito, G. A. On distinguishing adsorption from surface precipitation // *Geochemical Processes at Mineral Surfaces* / ed. J. A. Davis, K. H. Hayes. – Washington, DC: American Chemical Society, 1986. – (Amer. Chem. Soc. Symp. Ser.; 323). – P. 217–228. – no [80].
229. Stollenwerk, K. G. Modeling the effects of variable groundwater chemistry on adsorption of molybdate // *Water Resources Research*. – 1995. – Vol. 31, N 2. – P. 347–357.
230. Stollenwerk, K. G. Geochemical processes controlling transport of arsenic in groundwater: a review of adsorption // *Arsenic in Ground Water* / ed. A. H. Welch, K. G. Stollenwerk. – Dordrecht, The Netherlands : Kluwer Academic Publishers, 2003. – Chap. 3. – P. 67–100.
231. Stumm, W. *Aquatic Chemistry* / W. Stumm, J. J. Morgan. – N. Y. : Wiley Interscience, 1970. – 583 p. – no [124].
232. Stumm, W. *Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters*, 2nd ed. / W. Stumm, J. J. Morgan. – N. Y. : Wiley Interscience, 1981. – 780 p. – no [50, 230].
233. Stumm, W. *Aquatic Chemistry*, 3rd ed. / W. Stumm, J. J. Morgan. – N. Y. : John Wiley & Sons, Inc., 1996. – 1022 p. – no [41, 121].
234. Sullivan, K. A. Diagenetic cycling of arsenic in Amazon shelf sediments / K. A. Sullivan, R. C. Aller // *Geochimica et Cosmochimica Acta*. – 1996. – Vol. 60, N 9. – P. 1465–1477.
235. Sun, X. Adsorption and oxidation of arsenite on goethite / X. Sun, H. E. Doner // *Soil Sci*. – 1998. – Vol. 163, N 4. – P. 278–287.
236. Sung, W. Oxidative removal of Mn(II) from solution catalyzed by the  $\gamma$ -FeOOH (lepidocrocite) surface / W. Sung, J. J. Morgan // *Geochimica et Cosmochimica Acta*. – 1981. – Vol. 45, N 12. – P. 2377–2383.
237. Swedlund, P. J. Arsenic removal from geothermal bore waters: the effect of monosilicic acid / P. J. Swedlund, J. G. Webster // G. B. Arehart, J. R. Hulston (eds.) *Water–Rock Interaction : Proc. 9th Internat. Symp.*, Taupo, New Zealand, 1998. – Rotterdam : Balkema, 1998. – P. 947–950. – no [223].
238. Swedlund, P. J. Adsorption and polymerization of silicic acid on ferrihydrite, and its effect on arsenic adsorption / P. J. Swedlund, J. G. Webster // *Water Research*. – 1999. – Vol. 33, N 16. – P. 3413–3422.
239. Takahashi, Y. Comparison of adsorption behavior of multiple inorganic ions on kaolinite and silica in the presence of humic acid using the multitracer technique / Y. Takahashi, Y. Minai, S. Ambe, Y. Makide, F. Ambe // *Geochimica et Cosmochimica Acta*. – 1999. – Vol. 63, N 6. – P. 815–836.

240. Takamatsu, T. Determination of arsenate, arsenite, monomethylarsonate, and dimethylarsinate in soil polluted with arsenic / T. Takamatsu, H. Aoki, T. Yoshido // *Soil Sci.* – 1982. – Vol. 133, N 4. – P. 239–246.
241. Takamatsu, T. The role of Mn<sup>2+</sup>-rich hydrous manganese oxide in the accumulation of arsenic in lake sediments / T. Takamatsu, M. Kawashima, M. Koyama // *Water Research.* – 1985. – Vol. 19, N 8. – 1029–1032.
242. Tanizaki, Y. Physicochemical speciation of trace elements in river water by means of ultrafiltration / Y. Tanizaki, M. Yamazaki, S. Nagatsuka // *Bull. Chem. Society of Japan.* – 1985. – Vol. 58, N 10. – P. 2995–3002. – no [132].
243. Tejedor-Tejedor, M. I. Protonation of phosphate on the surface of goethite as studied by CIR-FTIR and electrophoretic mobility / M. I. Tejedor-Tejedor, M. A. Anderson // *Langmuir.* – 1990. – Vol. 6, N 5. – P. 979–987.
244. Tempel, R. N. Geochemical modeling approach to predicting arsenic concentrations in a mine Pit Lake / R. N. Tempel, L. A. Shevenell, P. Lechler, J. Price // *Appl. Geochemistry.* – 2000. – Vol. 15, N 4. – P. 475–492.
245. Thanabalasingam, P. Arsenic sorption by humic acids / P. Thanabalasingam, W. F. Pickering // *Environ. Pollution Series B.* – 1986. – Vol. 12, N 3. – P. 233–246.
246. The distribution coefficient, K<sub>d</sub> // Baes C. F., III, Sharp R. D., Sjoreen A. L., Shor R.W. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture / U. S. Department of Energy, Oak Ridge National Laboratory. ORNL-5786. – 1984. – P. 53, 58–64. – URL: <http://homer.ornl.gov/baes/documents/ornl5786-2.pdf>
247. Thirunavukkarasu, O. S. Removal of arsenic in drinking water by iron oxide-coated sand and ferrihydrite – Batch studies / O. S. Thirunavukkarasu, T. Viraraghavan, K. S. Subramanian // *Water Quality Res. J. of Canada.* – 2001. – Vol. 36, N 1. – P. 55–70. – no [223].
248. Thomann, R. V. Physico-chemical model of toxic substances in the Great Lakes / R. V. Thomann, D. M. Di Toro // *J. of Great Lakes Res.* – 1983. – Vol. 9, N 4. – P. 474–496. – no [46].
249. Thurman, E. M. *Organic Geochemistry of Natural Waters.* – Dordrecht, The Netherlands : Kluwer, 1985. – 497 p. – no [230].
250. Tipping, E. The adsorption of aquatic humic substances by iron oxides // *Geochimica et Cosmochimica Acta.* – 1981. – Vol. 45, N 2. – P. 191–199.
251. Tye, A. M. Predicting arsenic solubility in contaminated soils using isotopic dilution techniques / A. M. Tye, S. D. Young, N. M. J. Crout, H. Zhang [et al.] // *Environ. Sci. & Technol.* – 2002. – Vol. 36, N 5. – P. 982–988.
252. USEPA. Diffuse-layer sorption reactions for use in MINTEQA2 for HWIR metals and metalloids. – Athens, GA: Natl. Exposure Res. Lab., 1999. – no [270].
253. Van der Hoek, E. Sorption of As and Se on mineral components of fly ash: relevance for leaching processes / E. Van der Hoek, P. A. Bonouvrie, R. N. J. Comans // *Appl. Geochemistry.* – 1994. – Vol. 9, N 4. – P. 403–412.
254. Van der Zee, S. E. A. T. M. Model for long-term phosphate reaction kinetics in soils / S. E. A. T. M. Van der Zee, W. H. van Riemsdijk // *J. of Environ. Quality.* – 1988. – Vol. 17, N 1. – P. 35–41.
255. Van Geen, A. Complexation of carbonate species at the goethite surface: Implications for adsorption of metal ions in natural waters / A. Van Geen, A. P. Robertson, J. O. Leckie // *Geochimica et Cosmochimica Acta.* – 1994. – Vol. 58, N 9. – P. 2073–2086.



256. Van Riemsdijk, W. H. Phosphate sorption by soils. I. A diffusion–precipitation model for the reaction of phosphate with metal oxides in soil / W. H. Van Riemsdijk, L. J. M. Boumans, F. A. M. de Haan // *Soil Sci. Society of America J.* – 1984. – Vol. 48, N 3. – P. 537–541.
257. Vezina, A. F. Iron transport and distribution between freshwater and sediments over different time scales / A. F. Vezina, R. J. Cornett // *Geochimica et Cosmochimica Acta.* – 1990. – Vol. 54, N 10. – P. 2635–2644.
258. Villalobos, M. Carbonate adsorption on goethite under closed and open CO<sub>2</sub> conditions / M. Villalobos, J. O. Leckie // *Geochimica et Cosmochimica Acta.* – 2000. – Vol. 64, N 22. – P. 3787–3802.
259. Violante, A. Competitive sorption of arsenate and phosphate on different clay minerals and soils / A. Violante, M. Pigna // *Soil Sci. Society of America J.* – 2002. – Vol. 66, N 6. – P. 1788–1796.
260. Wagman, D. D. The NBS tables of chemical thermodynamic properties. Selected values for inorganic and C1 and C2 organic substances in SI Units / D. D. Wagman, W. H. Evans, V. B. Parker, R. H. Shumm [et al.] // *J. of Physical & Chemical Reference Data.* – 1982. – Vol. 11, Suppl. N 2. – P. 1–392.
261. Waltham, C. A. Kinetics of arsenic adsorption on goethite in the presence of sorbed silicic acid / C. A. Waltham, M. J. Eick // *Soil Sci. Society of America J.* – 2002. – Vol. 66, N 3. – P. 818–825.
262. Wauchope, R. D. Adsorption of phosphate, arsenate, methanearsonate, and cacodylate by lake and stream sediments: comparison with soils / R. D. Wauchope, L. L. McDowell // *J. of Environ. Quality.* – 1984. – Vol. 13, N 3. – P. 499–504.
263. Waychunas, G. A. Surface chemistry of ferrihydrite: P. I. EXAFS studies of the geometry of coprecipitate and adsorbed arsenate / G. A. Waychunas, B. A. Rea, C. C. Fuller, J. A. Davis // *Geochimica et Cosmochimica Acta.* – 1993. – Vol. 57, N 10. – P. 2251–2269.
264. Welch, A. H. Arsenic in groundwater of the western United States / A. H. Welch, M. S. Lico, J. L. Hughes // *Ground Water.* – 1988. – Vol. 26, N 3. – P. 333–347.
265. Welch, A. H. Factors controlling As and U in shallow groundwater, southern Carson Desert, Nevada / A. H. Welch, M. S. Lico // *Appl. Geochemistry.* – 1998. – Vol. 13, N 4. – P. 521–539.
266. Wenzel, W. W. Arsenic in field-collected soil solutions and extracts of contaminated soils and its implication to soil standards / W. W. Wenzel, A. Brandstetter, H. Wutte, E. Lombi [et al.] // *J. of Plant Nutrition & Soil Sci.* – 2002. – Vol. 165, N 2. – P. 221–228.
267. Widerlund, A. Early diagenesis of arsenic in sediments of the Kalix River estuary, Northern Sweden / A. Widerlund, J. Ingri // *Chemical Geology.* – 1995. – Vol. 125, N 3–4. – P. 185–196.
268. Wilkie, J. A. Adsorption of arsenic onto hydrous ferric oxide: Effects of adsorbate / adsorbent ratios and co-occurring solutes / J. A. Wilkie, J. G. Hering // *Colloids & Surfaces. A: Physicochemical & Engineering Aspects.* – 1996. – Vol. 107. – P. 97–110.
269. Willett, I. R. Migration of phosphate into aggregated particles of ferrihydrite / I. R. Willett, C. J. Chartres, T. T. Nguyen // *J. of Soil Sci.* – 1988. – Vol. 39, N 2. – P. 275–282.
270. Williams, L. E. Adsorption and transport of arsenic(V) in experimental subsurface systems / L. E. Williams, M. O. Barnett, T. A. Kramer, J. G. Melville // *J. of Environ. Quality.* – 2003. – Vol. 32, N 3. – P. 841–850.

271. Williams, M. Arsenic contamination in surface drainage and groundwater in part of the southeast Asian tin belt, Nakhon Si Thammarat Province, southern Thailand / M. Williams, F. Fordyce, A. Paijitprapapon, P. Charoenchaisri // *Environ. Geology*. – 1996. – Vol. 27, N 1. – P. 16–33.
272. Woolson, E. A. Fate of arsenicals in different environmental substrate // *Environ. Health Perspectives*. – 1977. – Vol. 19. – P. 73–81.
273. Xu, H. Influence of pH and organic substance on the adsorption of As(V) on geologic materials / H. Xu, B. Allard, A. Grimvall // *Water, Air, & Soil Pollution*. – 1988. – Vol. 40, N 3–4. – P. 293–305.
274. Xu, H. Effects of acidification and natural organic materials on the mobility of arsenic in the environment / H. Xu, B. Allard, A. Grimvall // *Water, Air, & Soil Pollution*. – 1991. – Vol. 57–58, N 1. – P. 269–278.
275. Yan, X.-P. Distribution of arsenic(III), arsenic(V) and total inorganic arsenic in pore-waters from a thick till and clay-rich aquitard sequence, Saskatchewan, Canada / X.-P. Yan, R. Kerrich, M. J. Hendry // *Geochimica et Cosmochimica Acta*. – 2000. – Vol. 64, N 15. – P. 2637–2648.
276. Zachara, J.M. Chromate adsorption on amorphous iron oxyhydroxide in the presence of major groundwater ions / J. M. Zachara, D. C. Girvin, R. L. Schmidt, C. T. Resch // *Environ. Sci. & Technol.* – 1987. – Vol. 21, N 6. – P. 589–594.
277. Zobrist, J. Mobilization of arsenite by dissimilatory reduction of adsorbed arsenate / J. Zobrist, P. R. Dowdle, J. A. Davis, R. S. Oremland // *Environ. Sci. & Technol.* – 2000. – Vol. 34, N 22. – P. 4747–4753.