

[Home](#) > [Journal](#) > [Earth & Environmental Sciences](#) > [JEP](#)[Indexing](#) [View Papers](#) [Aims & Scope](#) [Editorial Board](#) [Guideline](#) [Article Processing Charges](#)[JEP](#) > Vol.2 No.8, October 2011

OPEN ACCESS

Metal Transport Parameters in Residual Soil with an Undisturbed and Remolded Structure Percolated by an Acid Solution

PDF (Size: 628KB) PP. 1076-1083 DOI: 10.4236/jep.2011.28124

Author(s)

Eduardo Pavan Korf, Antonio Thomé, Nilo Cesar Consoli, Rafael de Souza Timbola, Gláucia Carine dos Santos

ABSTRACT

There is not enough information about metal transport parameters in residual soil. These soils are generally structured and still there is no answer to what happens with the contaminant transport parameters when an acid solution with metal percolates this material with different structure. The objective of this study was to determine the contaminant transport parameters for Cd, Ni, Cu and Zn metals in an acid multispecies solution to a residual soil from south Brazil with an undisturbed and remolded structure. Column tests were carried out to determine the k_d , R_d , D_h transport parameters. It was possible to conclude that the magnitude of the k_d , R_d and D_h parameter did not vary significantly with the soil structure.

KEYWORDS

Pollutant Transport, Column Equipment, Natural Attenuation, Dissolved Metals, Analytical Simulation

Cite this paper

E. Korf, A. Thomé, N. Consoli, R. Timbola and G. Santos, "Metal Transport Parameters in Residual Soil with an Undisturbed and Remolded Structure Percolated by an Acid Solution," *Journal of Environmental Protection*, Vol. 2 No. 8, 2011, pp. 1076-1083. doi: 10.4236/jep.2011.28124.

References

- [1] [1] O. M. Bermea, E. H. Álvarez, I. Gaso and N. Segovia, " Heavy Metal Concentrations in Surface Soils from Mexico City," *Bulletin of Environmental Contamination and Toxicology*, Vol. 68, No. 3, 2002, pp. 383-388. doi:10.1007/s001280265
- [2] E. P. Achterberg, C. B. Braungardt and G. E. Millward, " Metal Behaviour in an Estuary Polluted by Acid Mine Drainage: The Role of Particulate Matter," *Environmental Pollution*, Vol. 121, No. 2, 2003, pp. 283-292. doi:10.1016/S0269-7491(02)00216-6
- [3] A. Akcil and S. Koldas, " Acid Mine Drainage (AMD): Causes, Treatment and Cases Studies," *Journal of Cleaner Production*, Vol. 14, No. 12-13, 2006, pp. 1139- 1145. doi:10.1016/j.jclepro.2004.09.006
- [4] O. Y. Bittar, " Evaluation of the Recovery of Degraded sites by Mining in the Metropolitan Region of São Paulo," Ph.D. Thesis, Escola Politécnica da Universidade de São Paulo, São Paulo, in Portuguese, 1997.
- [5] R. Nascentes, L. P. Ernani, P. S. Silva and I. Azevedo, " Heavy Metals Removal with the Use of Coal," REGEO, in Portuguese, 2007.
- [6] C. Chen and I. Chiou, " Remediation of Heavy Metal- Contaminated Farm Soil Using Turnover and Attenuation Method Guided with a Sustainable Management Framework," *Environmental Engineering Science*, Vol. 25, No. 1, 2008. doi:10.1089/ees.2006.0183
- [7] A. Knop, " Study the Behavior of Liners Attacked by Sulfuric Acid," Ph.D. Thesis, Universidade Federal do Rio Grande do Sul, Porto Alegre, in Portuguese, 2007.
- [8] A. Lestan, L. Chun-Ling and L. Xiang-Dong, " The Use of Chelating Agents in the Remediation of

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[JEP Subscription](#)[Most popular papers in JEP](#)[About JEP News](#)[Frequently Asked Questions](#)[Recommend to Peers](#)[Recommend to Library](#)[Contact Us](#)

Downloads: 301,496

Visits: 673,032

[Sponsors, Associates, and Links >>](#)

- [The International Conference on Pollution and Treatment Technology \(PTT 2013\)](#)

- [9] A. K. Das, A. Roy, M. Koschorreck, S. M. Mandal, K. Wendt-Pootthoff and J. Bhattacharya, " Occurrence and Role of Algae and Fungi in Acid Mine Drainage Environment with Special Reference to Metals and Sulfate Immobilization," Water Research, Vol. 43, No. 4, 2009, pp. 883-894. doi: 10.1016/j.watres.2008.11.046
- [10] C. A. Maccauley, A. D. O' Sullivan, M. W. Milke, P. A. Weber and D. A. Trumm, " Sulfate and Metal Removal in Bioreactors Treating Acid Mine Drainage Dominated with Iron and Aluminum," Water research, Vol. 43, No. 4, 2009, pp. 961-970. doi: 10.1016/j.watres.2008.11.029
- [11] S. M. Equeenuddin, S. Tripathy, P. K. Sahoo and M. K. Panigrahi, " Hydrogeochemical Characteristics of Acid Mine Drainage and Water Pollution at Makum Coalfield, India," Journal of Geochemical Exploration, 2010, pp. 8.
- [12] A. K. Krishna and P. K. Govil, " Assessment of Heavy Metal Contamination in Soils around Manali Industrial Area, Chennai, Southern India," Environment Geology, Vol. 54, No. 7, 2008, pp. 1465-1472. doi: 10.1007/s00254-007-0927-z
- [13] L. Diels, N. Van Der Lelie and L. Bastiaens, " New Developments in Treatment of Heavy Metal Contaminated Soils," Environmental Science & Bio/Technology, Vol. 1, 2002, pp. 75-82.
- [14] A. L. Lafuente, C. González, J. R. Quintana, A. Vazquez and A. Romero, " Mobility of Heavy Metals in Poorly Developed Carbonate Soils in the Mediterranean Region," Geoderma, Vol. 145, No. 3-4, 2008, pp. 238-244. doi: 10.1016/j.geoderma.2008.03.012
- [15] A. M. Sarmiento, M. Ollás, J. M. Nieto, C. R. Cánovas and J. Delgado, " Natural Attenuation Processes in Two Water Reservoirs Receiving Acid Mine Drainage," Science of Total Environment, Vol. 407, No. 6, 2009, pp. 2051- 2062. doi: 10.1016/j.scitotenv.2008.11.011
- [16] R. N. Yong, A. M. O. Mohamed and B. P. Warkentin, " Principles of Contaminant Transport in Soils," Elsevier, Amsterdam, 1992, pp. 327.
- [17] C. D. Shackelford, " Contaminant Transport, Geotechnical Practice for Waste Disposal," Chapman & Hall, London, 1993, pp. 33-65. doi: 10.1007/978-1-4615-3070-1_3
- [18] C. D. Shackelford, " Cumulative Mass Approach For Column Test," Journal of Geotechnical Engineering, Vol. 121, No. 10, 1995, pp. 696-703. doi: 10.1061/(ASCE)0733-9410(1995)121:10(696)
- [19] R. N. Young, W. Z. W. Yaacobi, W. S. P. Bentley, C. Harris and B. K. Tan, " Partitioning of Heavy Metals on Soil Samples from Column Tests. Engineering Geology," Elsevier, Vol. 60, 2001, pp. 307-322.
- [20] P. O. S. Costa, " Laboratory Evaluation, of the Contaminants Transport in Soil of Landfill Sauipe/Ba," Master's Thesis, Departamento of Civil Engineering, Pontificia Universidade Católica do Rio de Janeiro, Rio de Janeiro, in Portuguese, 2002.
- [21] J. Krahn, " Transport Modeling with CTRAN/W: An Engineering Methodology," GEOSLOPE International, California, 2004.
- [22] C. Ochola and H. Moo-Young, " Evaluation of Metal Attenuation through Paper Clay Utilized for Containment of Contaminated Groundwater," Journal of Environmental Engineering, Vol. 130, No. 8, 2004, pp. 873-880. doi: 10.1061/(ASCE)0733-9372(2004)130:8(873)
- [23] M. P. H. Moncada " Laboratory Study of Collapse Characteristics and Solute Transport Associated with the Infiltration of Caustic Liquor in a Laterite Soil," Master's Thesis, Departamento of Civil Engineering, Pontificia Universidade Católica do Rio de Janeiro, Rio de Janeiro, in Portuguese, 2004.
- [24] H. D. Sharma and K. R. Reddy, " Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies," John Wiley & Sons, New Jersey, 2004, p. 992.
- [25] I. C. D. Azevedo, R. C. Nascentes, T. A. Matos and F. R. Azevedo, " Transport Parameters Determination of Heavy Metals in an Oxisol Compacted," Revista de Engenharia Agrícola e Ambiental, in Portuguese, Vol. 9, No. 4, 2005, pp. 623-630.
- [26] E. Azambuja, D. B. Cancelier and A. S. Nanni, " Soil Contamination by LNAPL: Diagnosis and Remediation Discussion," in Portuguese, GEOSUL 2000, Accessed in 18 June 2006. <http://www.azambuja.com.br/acervo/geosul2000.pdf>

- [27] A. W. C. Delgado, " Transport Mechanisms of Heavy Metals," National Environmental Congress 2, Mini Course, Salvador, in Portuguese, 2002.
- [28] A. V. Streck, " Soils from Rio Grande do Sul," EMATER, Porto Alegre, in Portuguese, 2002.
- [29] American Society for Testing and Materials (ASTM), " Standard Classification of Soils for Engineering Purposes: D2487," Philadelphia, 1993, pp. 11.
- [30] J. K. Mitchell and K. Soga " Fundamentals of Soil Behavior," 3rd Edition, John Wiley & Sons Inc, New York, 2005.
- [31] A. J. Meurer, " Fundamentals of Soils Chemistry," 3rd Edition, Evangraf, Porto Alegre, in Portuguese, 2006, pp. 73-99.
- [32] Companhia De Tecnologia Em Saneamento Ambiental (CETESB), in Portuguese, Available in 2005, Accessed in June 28 2006. http://www.cetesb.sp.gov.br/Solo/relatorios/tabela_valores_2005.pdf
- [33] A. Ogata and R. B. Banks, " A Solution of the Differential Equation of Longitudinal Dispersion in Porous Media," US Geological Survey, Professional Paper, No. 411-A, 1961.