

Biogeochemistry of Trace Elements

Edited by

Domy C. Adriano

Savannah River Ecology Laboratory, University of Georgia

Zueng-Sang Chen

Shang-Shyng Yang

National Taiwan University

A special issue of

Environmental Geochemistry and Health, Volume 16

ISSN 0269-4042

Edited by

Brian E. Davies

University of Bradford

SCIENCE AND TECHNOLOGY LETTERS

British Library Cataloguing in Publication Data

Biogeochemistry of trace elements

A catalogue record of this book is available from the British Library

ISBN 0-905927-69-9

© Science and Technology Letters, Northwood, 1994

Production editor: Sara Nash

Typeset by DL Technology, PO Box 9, Buckhurst Hill, Essex

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher, Science and Technology Letters, Tel: 019238 23586, Fax: 019238 25066.

Contents

Preface		i
Acknowledgements		iii
Technical Reports		
Chapter 1	Pd and Cd Complexation with Soluble Organic Carbon and Speciation in Alkaline Soil Leachates <i>I. Lamy, P. Cambier and S. Bourgeois</i>	1
Chapter 2	Measuring pH-gradients in Soils at a Spatial Resolution of Millimeters <i>Christiane Marth and Michael Bredemeier</i>	17
Chapter 3	The Effect of Hydraulic Conductivity on the Spatial Variability of Cadmium in Paddy Soils <i>Wen-Lian Chang, L.-C. Chang and Y.-P. Hsu</i>	29
Chapter 4	Bioavailability Assessments of Cd, Zn and Pb in Polluted Soils with the Indicator Plant <i>Plantago lanceolata</i> L. <i>Vida Hudnik, Marko Zupan, Franc Lobnik and Spela Kozak Legisa</i>	39
Chapter 5	Zinc Binding by Montmorillonite Polymers in the Presence of Citrate <i>R.P.T. Janssen, M.G.M. Bruggenwert and W H. van Riemsdijk</i>	53
Chapter 6	Immobilization of Contaminants in Alkaline Solid Wastes Derived from Fossil Energy Conversion Process <i>K.J. Reddy, S.P. Gloss, T.A. Tawfic and J.I. Drever</i>	69
Chapter 7	The use of Synthetic Zeolites to Reduce Plant Metal Uptake and Phytotoxicity in Two Polluted Soils <i>Irina Rebedea and Nicholas W. Lepp</i>	81
Chapter 8	Adsorption of Metals on Oxides formed from Fe(NO ₃) ₃ , FeCl ₃ and Fe(ClO ₄) ₃ Solutions <i>S.L. Lo, S.H. Shiu, C.F. Lin and D.Y. Lee</i>	89
Chapter 9	Isolation of Cd-Resistant Bacteria from Heavy Metal Contaminated Soil and their Ability to Biosorb Cd <i>Shinjiro Kanazawa and Keita Mori</i>	101

Chapter 10	Metal Pollutants in Landfill Soils and their Effect on Sugarcane <i>Wen-Cheh Liu, Jiing-Shan Tzeng, Song-Wu Li, Min Chao-Wang and Yin-Po Wang</i>	115
Chapter 11	Some Recent Developments in Preconcentration Techniques for Trace Elements <i>C.M. Wai</i>	131
Chapter 12	The Application of Quadrupole Mass Spectrometry to Assess the Effects of Sewage Sludge on Gas Composition in Undisturbed Soil Columns <i>Tamás Neméth, Géza Pártay, Klára Bujtás and András Lukács</i>	141
Chapter 13	Uptake of Heavy Metals by Plants in Taiwan <i>Gwo-Chen Li, Haw-Tarn Lin and Chi-Sen Lai</i>	153
Chapter 14	Plants for Cadmium Polluted Soils in Northern Taiwan <i>Dar-Yuan Lee and Zueng-Sang Chen</i>	161
Chapter 15	Trace Elements in Plants Growing in Contrasting Ecosystems in Sri Lanka: Analytical Aspects <i>Ranjith Jayasekera and Matthias Rossbach</i>	171
Chapter 16	Selenium Speciation in Two River-Estuary Systems with Different Pollution Levels <i>Jia-Jang Hung and Chuen-Pwu Shy</i>	181
Chapter 17	Copper Upper Critical Levels for Plants on Copper-Polluted Soils and the Effects of Organic Additions <i>Sergio P. Gonzalez</i>	195
Chapter 18	Uptake of Phosphorus and Cadmium by Maize from an Acid Soil Treated with High Rates of Phosphate Fertilizers Varying in Cadmium Content <i>S.H. Chien and R.G. Menon</i>	205
Chapter 19	Differential Pulse Cathodic Stripping Voltammetric Determination of Selenium in the Presence of Citric Acid <i>Jia-Der Fang and Chuen-Ying Liu</i>	215
Chapter 20	Copper Organically Bound to Humic Substances and Organic Residues in Taiwan Sediments <i>Tsu-Chang Hung, Shiann-Chang Tsay and Pei-Jie Meng</i>	231

Chapter 21	Double Focusing ICP-MS: A Powerful Technique for Systematic Analysis of Ultra-trace Elements in Terrestrial Water <i>Shin-ichi Yamasaki, Akito Tsumura and Masashi Uwasawa</i>	247
Chapter 22	Structure and Function of DMSO Reductase, a Molybdoenzyme from a Photosynthetic Bacterium, and its Role in Sulfur Cycling in the Hydrosphere <i>Sunao Yamazaki, Akira Okubo and Toshio Satoh</i>	261
Chapter 23	Natural Atmospheric Pollution Produced by the Particulate Matter Ejected from the Hudson Volcano in Chile <i>Margarita Préndez, Jose Hevia and M Adriana Carrasco</i>	273
Chapter 24	A Soil and Plant Pollution Case Study in an Industrial Area in Slovenia <i>Franc Lobnik, Marko Zupan, Vida Hudnik and Nataša Jaecks Vidic</i>	287
Chapter 25	Effects of Vanadium on Growth of Some Vegetable Crops <i>Bing-Teh Cheng</i>	301
Chapter 26	Major and Trace Elements in Different Substrata of a <i>Nothofagus pumilio</i> Forest. Torres del Paine National Park, XII Region, Chile <i>Margarita Préndez, René Covarrubias and M. Adriana Carrasco</i>	309
Chapter 27	Physicochemical Durability Study of a Solidified Electroplating Sludge <i>Gordon C.C. Yang and Kai-Lun Kao</i>	329
Chapter 28	Distribution of N, Fe and Mn Ions in a Treated Sewage Water System <i>T.M. Abu-Sharar, M.K. Fayyad and M.A. Zorba</i>	341
Chapter 29	Heavy Metal Accumulation in 0-20 cm Soil Layer Around the Ventanas Industrial Area (V.region of Valparaiso, Chile) <i>Sergio P Gonzalez, Regina V Ite and Ximena A Galvez</i>	353
Chapter 30	Capillary Electrophoretic Analysis of Trace Metal Cations in Soil Samples <i>Y.-H. Lee and T.-I. Lin</i>	365

Chapter 31	The Behaviour of Trace Metals in the Riverine, Estuarine and Coastal Environments of Southwestern Taiwan <i>Jia-Jang Hung</i>	375
Chapter 32	Research Methodology for Determining Background Levels of Trace Elements in Chinese Soils <i>H.K.Wang</i>	397
Chapter 33	Metal Content of Hog Sludge with Various Methods of Treatment <i>Shang-Shyng Yang, Wan-Jin Swei, Chia-Bei-Wei and Chih-Lin Luh</i>	415
Chapter 34	Metal Content and Effect of Organic Fertilizer on Crop Growth <i>Shang-Shyng Yang, Ren Shih Chung and Wan-Jin Swei</i>	441
Chapter 35	Recent Studies on Sewage Sludge Fertilizer <i>Ken-ichi Kameyama, Kazuaki Arai and Isao Dohdoh</i>	455
Chapter 36	The Availability of Cd and Zn to Cereal Crops Grown in Soil Amended with Cd or Zn Carbonate <i>Anna Chlopecka</i>	475
Chapter 37	The Effect of Metal Sources and Indigenous Soil pH on Metal Fractions in Soil <i>Anna Karczewska, Walker W. Wenzel and Radmila Mavrodieva</i>	487
Chapter 38	Model Experiments to Assess the Fate of Heavy Metal in Soils <i>Tamas Németh, Endre Molnár, Julianna Csillag, András Lukács, Klára Bujtás and Martinus Th. van Genuchten</i>	505
Chapter 39	The Induction of Cytosolic Cu, Zn-Superoxide Dismutase in Soybean Roots by Copper <i>Praphasri Chongpraditnun, Ichiro Kawashima, Satoshi Mori and Mitsuo Chino</i>	515
Chapter 40	The Adsorption of Cd, Zn, Cu and Pb in Acid Forest Soils <i>Andreas Schulte</i>	525
Chapter 41	Trace Metal-Herbicide-Humic Acid Interactions: Electroanalytical Approach to their Coordination Studies <i>Irena Grabec, Bozidar Ogorevc, Vida Hudnik and Franc Lobnik</i>	537

- Chapter 42 Influence of a Copper Smelter (Brixlegg, Austria)
on Grassland Populations of Earthworms 551
*Margit Palzenberger, Gabriele Lüftenegger
and Hannes Pohla*

Reviews and Analyses

- Chapter 43 Cancer and Soil Characteristics in the People's Republic
of China 565
Jingsheng Chen, Harold D Foster and Liping Zhang
- Chapter 44 Effects of Soil Spatial Variability on Exposure of
Organisms to Heavy Metals 589
*Mari P.J.C. Marinussen, Sjoerd E.A.T.M. van der Zee
and Frans A.M. de Haan*
- Chapter 45 Plants as Biomonitors - Potential Advantages and Problems 601
Bernd Markert
- Chapter 46 Selenium, Arsenic and Chromium Redox Chemistry in
Wetland Soils and Sediments 615
Patrick H. Masscheleyn and William H Patrick, Jr
- Chapter 47 Use of Small Plants as Trace Element Phytomonitors, with
Emphasis on the Common Dandelion, *Taraxacum Officinale* 627
Joseph H. Rule
- Chapter 48 Analytical Techniques for Measuring Trace Elements 655
M. Ali Tabatabai
- Chapter 49 Trace Elements in Soil Along a Road Passing a
Geochemically Heterogenous Area 685
Margit Palzénberger and Hannes Pohla