Acid Sulfate Weathering

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Contents

Foreword ................................................................. v
Preface ................................................................. vii

PART I
SULFIDE ACCUMULATION IN SEDIMENTS

Physiography of Coastal Sediments and Development of Potential Soil Acidity
L. J. Pons, N. Van Breemen, and P. M. Driessen ....................... 1

Controls and Consequences of Sulfate Reduction in Recent Marine Sediments
M. B. Goldhaber and I. R. Kaplan ................................. 19

PART II
CHEMISTRY, MICROBIOLOGY AND MINERALOGY OF ACID SULFATE WEATHERING

Aqueous Pyrite Oxidation and the Consequent Formation of Secondary Iron Minerals
Darrell Kirk Nordstrom ........................................... 37

Microbiological Transformations of Iron and Sulfur and their Applications to Acid Sulfate Soils and Tidal Marshes
K. C. Ivarson, G. J. Ross, and N. M. Miles ........................ 57

Microbial Formation of Basic Ferric Sulfates in Laboratory Systems and in Soils
G. J. Ross, K. C. Ivarson, and N. M. Miles .................. 77

PART III
SOILS WITH ACID SULFATE WEATHERING FEATURES OR WITH GYPSUM OF OTHER ORIGIN

Genesis, Morphology and Classification of Acid Sulfate Soils in Coastal Plains
N. Van Breemen ................................................ 95

Morphological and Mineralogical Features Related to Sulfide Oxidation under Natural and Disturbed Land Surfaces in Maryland
D. P. Wagner, D. S. Fanning, J. E. Foss, M. S. Patterson,
and P. A. Snow .................................................. 109

Alfisols and Ultisols with Acid Sulfate Weathering Features in Texas
C. D. Carson, D. S. Fanning, and J. B. Dixon ................... 127
Gypsiferous Soils in the Western United States
W. D. Nettleton, R. E. Nelson, B. R. Brasher, and
P. S. Derr ................................................................. 147

PART IV
EARTH SURFACE MANIPULATION AND MINESPOIL
RECLAMATION

Mineralogical Properties of Lignite Overburden as they Relate
to Mine Spoil Reclamation
J. B. Dixon, L. R. Hossner, A. L. Senkayi, and
K. Egashira ............................................................. 169

Relation of Pyritic Sandstone Weathering to Soil and Minesoil
Properties
R. N. Singh, W. E. Grube, Jr., R. M. Smith, and
R. F. Keefer ............................................................. 193

Mineralogical Alterations that Affect Pedogenesis in Minesoils
from Bituminous Coal Overburdens
W. E. Grube, Jr., R. M. Smith, and J. T. Ammons ............. 209

Characteristics and Reclamation of “Acid Sulfate” Mine Spois
R. I. Barnhisel, J. L. Powell, G. W. Akin, and
M. W. Ebelhar .......................................................... 225
Foreword

Acid sulfate weathering is a subject of increased interest both nationally and internationally. Acid sulfate soils, in general, result from processes that release sulfuric acid into the soil system as the soil forms. This term is in turn applied to soils in which sulfuric acids have been, are being, or will be produced in amounts that have a lasting effect on principal soil characteristics. Such soils occur in all climatic zones of the earth with the majority of them being located in relatively recent coastal marine sediments. However, sulphidic materials which produce acid sulfates on oxidation are not limited to coastal regions. They are often associated with pyritic materials such as lignite. When such materials are brought to the soil surface through mining, construction, or other activities that disturb the soil, sulfuric acid may form making revegetation of the soil very difficult and releasing pollutants into surface and subsurface waters.

In depth understanding of the nature and properties of acid sulfate soils is necessary if they are to be reclaimed as a resource to be used in crop production. This reclamation is of increasing importance because of the expanding areas of potentially acid sulfate soils associated with expanded mining activities. While reclamation of these soils is important, it is far from simple because of the complexity of their chemical, microbiological, and mineralogical relationships. Increased understanding of these relationships must be developed so that these lands may be made productive, and that they not be sources of pollutants to the environment.

A symposium was held during the 1979 meetings of ASA and SSSA to bring together those working on acid sulfate soils so that the present state of knowledge could be shared. The intent was to broaden our understanding of the nature and properties of acid sulfate soils, so that reclamation attempts would be based on the combined knowledge of these individuals. This publication is the result of that symposium. It includes contributions of leading scientists in the area of acid sulfate soils. The Society is indebted to these authors as well as the organizers of the symposium and the editors of this special publication.

R. G. Gast, SSSA President, 1982
Preface

An international symposium held at Wageningen, The Netherlands, in 1972 (Dost, 1973) had a large impact in bringing the existence and nature of acid sulfate soils to the attention of scientists around the world. This 1972 symposium and a second international acid sulfate soils symposium, held in Thailand and Malaysia in 1981, have been concerned primarily with acid sulfate soil development and reclamation in modern sediments near sea coasts.

This publication, which contains papers presented at a symposium held at the Soil Science Society of America (SSSA) meetings at Colorado State University on 6 Aug. 1979, is not intended to replace publications resulting from the international symposia, but rather to emphasize that acid sulfate weathering is not confined to coastal soils. This publication shows the wide application of the principles of acid sulfate weathering in understanding and managing soils and geologic columns—particularly those that are subject to major manipulation in construction, in recovering mineral resources, etc. At the same time the publication further elucidates the pedogeochemistry of acid sulfate weathering and implies that many soils have been affected by this weathering.

More specifically the papers presented here seek a) to explain how sulfide bearing sediments accumulate (for further explanation of this subject readers should also consult publications such as the extensive paper by D. T. Rickard (1973); b) to describe the physical chemistry, microbiology, and mineralogy of acid sulfate weathering; c) to illustrate effects of acid sulfate weathering and associated pedogeochemical changes upon young and old soils and associated substrata; and d) to present examples of how this knowledge is being applied in man’s manipulations of the earth’s surface and of undesirable situations that may develop after such manipulations when this knowledge is ignored. An additional paper on gypsiferous soils reminds us that not all soils containing large amounts of sulfate minerals have been directly influenced by acid sulfate weathering.
The symposium that led to this publication was organized by Division S-9, Soil Mineralogy, of SSSA, and was co-sponsored by Divisions S-2 (Soil Chemistry), S-5 (Soil morphology, Genesis, and Classification), and S-6 (Soil and Water Management and Conservation). The SSSA further contributed to the symposium by supporting the travel expenses of Dr. Nico van Breemen of the Netherlands to the symposium.

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