PROCEEDINGS OF THE 2<sup>nd</sup> INTERNATIONAL CONFERENCE ON ADVANCES IN MINING AND TUNNELING 23-25 AUGUST 2012, HANOI, VIETNAM

# ADVANCES IN MINING AND TUNNELING

9 7 8 6 0 4 9 1 3 0 8 1 6

## PUBLISHING HOUSE FOR SCIENCE AND TECHNOLOGY

18 Hoang Quoc Viet Road, Caugiay District, Hanoi Tel: 04.2149040, 04.2149034, 04.2149041

Fax: 04.7910147. Email: nxb@vap.ac.vn. Website: www.vap.ac.vn

# ADVANCES IN MINING AND TUNNELING

PROCEEDINGS OF THE 2<sup>nd</sup> INTERNATIONAL CONFERENCE ON ADVANCES IN MINING AND TUNNELING 23-25 AUGUST 2012, HANOI, VIETNAM

Responsible for publishing:

Prof. Dr. Sc. Nguyen Khoa Son

Editor-in-Chief: Assoc. Prof. Dr. Bui Xuan Nam

Copy Editor: Nguyen Hoang

Cover Designer: Hung Anh

# Copyright @ 2012 Hanoi University of Mining and Geology, Vietnam

All rights reserved. No part of this publication or the information contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Although all care is taken to ensure the integrity and quality of this publication and the information herein, no responsibility is assumed by the publishers nor the author for any damage to property or person as a result of operation or use of this publication and/or the information contained herein.

Published by: Publishing House for Science and Technology, Hanoi, Vietnam

ISBN: 978-604-913-081-6

Printed in Vietnam

### ORGANIZATION

### CHAIRMEN

Assoc. Prof. Dr. Tran Dinh Kien Prof. Dr. Carsten Drebenstedt

### ORGANIZING COMMITTEE

Assoc. Prof. Dr. Tran Dinh Kien
Prof. Dr. Carsten Drebenstedt
Assoc. Prof. Dr. Le Hai An
Dr. Peter Kuschk
Dr. Nguyen Phu Vu
Assoc. Prof. Dr. Nguyen Quang Luat
Assoc. Prof. Bui Xuan Nam
Dr. Nguyen Hoang Nam
Prof. Dr. Vo Trong Hung
Assoc. Prof. Dr. Nguyen Phuong
Dr. Nguyen Duc Khoat

### SCIENTIFIC COMMITTEE

Prof. Dr. Carsten Drebenstedt Dr. Peter Kuschk Prof. Dr. David Laurence Prof. Dr. Kyuro Sasaki Prof. Dr. Tran Tam Prof. Dr. Toshifumi Igarashi Assoc. Prof. Dr. Le Hai An Assoc. Prof. Dr. Bui Xuan Nam Dr. Nguyen Quang Minh Prof. Dr. Vo Trong Hung Prof. Dr. Vo Chi My Assoc. Prof. Dr. Nguyen Quang Luat Dr. Bui Hoang Bac Dr. Pham Van Hoa Dr. Vu Dinh Hieu Dr. Nguyen Duc Khoat Dr. Do Van Binh Dr. Nguyen Hoang Nam Dr. Phan Quang Van MSc. Nguyen Ngoc Phu

### SECRETARIATS

Assoc. Prof. Dr. Bui Xuan Nam Dr. Nguyen Quang Minh

# **CONTENTS**

No		Page
	PREFACE	1
	NATURAL RESOURCES, MINE GEOLOGY AND GIS	
1	RESEARCH ON ORE CHARACTERIZATION AND POTENTIAL OF RARE EARTH ELEMENTS AT DONG PAO AREA, LAI CHAU PROVINCE, VIETNAM LUONG Quang Khang, BUI Hoang Bac, NGUYEN Quang Luat	5
2	ASSESSING QUALITY AND QUANTITY OF MY LAM HOT MINERAL WATER SOURCE, VIETNAM  DO Van Binh, TRAN Thi Thanh Thuy, DANG Huu On	9
3	INDEX OVERLAY GIS MODELING TECHNIQUE FOR TUNGSTEN EXPLORATION AT PLEIMEO AREA, KONTUM PROVINCE DO Manh An, BUI Hoang Bac, NGUYEN Tien Dung, KHUONG The Hung	15
4	CHROMITE ORE RESOURCES IN VIETNAM TRINH Xuan Ben, NGUYEN Xuan Quang	20
5	RESEARCH ON CHARACTERIZATION AND POTENTIAL OF TIN ORE AT CHAU TIEN AREA, NGHE AN PROVINCE, VIETNAM LUONG Quang Khang, BUI Hoang Bac, TRAN Le Chau	27
6	CHARACTERISTICS OF GROUNDWATER IN DA NANG CITY AND SOLUTION TO EXPLOIT IT EFFECTIVELY  DO Van Binh, LE Luong Hung	31
7	SILICA SAND POTENTIAL IN PHONG HIEN, THUA THIEN HUE, VIETNAM AND USE ORIENTATION  NGUYEN Thi Thuc Anh, NGUYEN Cam, NGUYEN Thanh Van, DAO Nguyen Viet, BUI Xuan Vinh	36
8	FEATURES ON THE QUALITY AND RESOURCE POTENTIAL OF DOLOMITE IN NINH BINH PROVINCE LUONG Quang Khang, BUI Hoang Bac, TRUONG Huu Manh	43
9	ANALYSIS OF GIS-REMOTE SENSING PROVIDING QUALTITATIVE GEOMORPHOLOGICAL VALUES SERVING FOR THE STUDY AND EXPLOITATION OF GEOHERITAGES OF BA BE LAKE AREA  PHAM Viet Ha, TRAN Tan Van, DOAN The Anh, TRAN Diep Anh, QUACH Duc Tin	47
10	HOW MANY OROGENIES TOOK PLACE IN THE SONG MA AND TRUONG SON UNITS? (NORTHWESTERN VIETNAM) KHUONG The Hung, BUI Hoang Bac, NGUYEN Tien Dung, NGUYEN Duy Hung	55
	MINING TECHNOLOGIES AND MANAGEMENT	
11	DEVELOPMENT OF THE BAN PHUC NICKEL PROJECT - THE FIRST STEP FOR BUILDING VIETNAM'S NICKEL INDUSTRY Mike BROWN, Simon BOOTH	63
12	TREND OF MECHANIZATION DEVELOPMENT FOR UNDERGROUND MINING IN QUANG NINH NGUYEN Anh Tuan, NHU Viet Tuan, DAO Hong Quang	71
13	USE OF COMBINED TRANSPORTATION FOR DEEP SURFACE COAL MINES IN	80

	QUANG NINH, VIETNAM	
	BUI Xuan Nam, LUU Van Thue, VU Dinh Hieu, LE Qui Thao, NGUYEN Hoang	
14	SELECTION ON SUITABLE METHODS TO DRILL WELLS FOR METHANE GAS RECOVERY IN UNDERGROUND COAL MINES	80
	TRAN Dinh Kien, PHAM Quang Hieu, NGUYEN Tran Tuan, NGUYEN Xuan Thao	
15	MULTI-AGENT DECISION SUPPORT SYSTEM FOR OPEN PIT MINING NGUYEN Duc Khoat, BUI Xuan Nam, NGUYEN Phu Minh Vuong	91
16	ORGANIZING PRODUCITON IN MECHANICAL LONGWALL AT VANG DANH COAL MINE	95
	DANG Quang Hung, TRAN Van Thanh, BUI Manh Tung, PHAM Cong Huong	
17	INTRODUCTION ON THE TWO - STREAM TECHNIQUES IN THE LIDAR SYSTEM	
.,	BUI Thi Thanh Lan, DONG Thi Linh	100
18	SELECTION ON SUITABLE HAULING METHOD OF WASTE ROCKS FOR DEO NAI COAL MINE	
	DO Ngoc Tuoc, NGUYEN Phu Vu, PHAM Van Viet, NGUYEN Hoang, LE Thi Minh Hanh	10:
	SELECTION ON THE MECHANIZED MINING METHODS SUITABLE FOR NGA HAI	
19	COAL AREA, QUANG HANH COAL COMPANY	109
	BUI Dinh Thanh, PHAM Ngoc Tuan, LE Quang Phue, TRAN Minh Tien	
	SELECTION ON SUITABLE MINING TECHNOLOGICAL SCHEMES OF	
20	HYDRAULIC BACKHOE EXCAVATOR FOR IRON ORE MINES	11
	LUU Van Thue, BUI Xuan Nam, LE Thi Thu Hoa, DO Ngoe Hoan, VU Dinh Truong	
21	SOLUTIONS TO FOLD AND FAULT AT HALAM COAL COMPANY, VIETNAM	125
	LE Tien Dung, TRAN Van Thanh, NGUYEN Van Sy, DO Hong Nguyen	12.
22	LIMESTONE QUARRYING PROCESS FOR CEMENT PRODUCTION OF VIETNAM CEMENT INDUSTRY CORPORATION (VICEM)	132
	DO Manh Cuong, BUI Xuan Nam	13.
23	CALCULATION ON PRESSURE USING SHIELDS 2ANSH AT MAOKHE JOYSTOCK COAL MINE, VIETNAM	147
	NGUYEN Van Thinh, TRAN Van Thanh, DINH Thi Thanh Nhan, TRINH Duc Duy	
24	TITANIUM PLACERS IN THE RED SAND DUNES IN BINH THUAN PROVINCE AND MEASURES FOR MANAGEMENT OF SUSTAINABLE MINING AND PROCESSING	150
	QUACH Duc Tin, TRINH Phuong Thao, HOANG Cao Phuong	
25	STANDARDS OF MICROCLIMATE CONDITIONS IN UNDERGROUND COAL MINES IN VIETNAM	157
25	STANDARDS OF MICROCLIMATE CONDITIONS IN UNDERGROUND COAL MINES IN VIETNAM  DANG Vu Chi, NGUYEN Cao Khai	157
	IN VIETNAM	
	DANG Vu Chi, NGUYEN Cao Khai  GEOSTATISTICAL APPROACH AND ITS APPICATION FOR GRADE	157
25	DANG Vu Chi, NGUYEN Cao Khai  GEOSTATISTICAL APPROACH AND ITS APPICATION FOR GRADE CONTROLLING IN OPEN PIT MINES	157

28	ESTABLISHMENT OF FORECASTING MODEL OF MICRO-TECTONIC FAULTS FOR COAL SEAMS: A CASE STUDY FOR HA LAM COAL MINE, QUANG NINH PROVINCE, VIETNAM	175
	PHAM Cong Khai	
29	COMMUNICATION IN RISK MANAGEMENT IN COAL MINING COMPANIES	
	NGUYEN Thi Hoai Nga, Jürgen KRETSCHMANN	181
30	QUESTIONS OF BUSINESS STRATEGY IN MINING ENTERPRISES OF VIETNAM NATIONAL COAL, MINERALS INDUSTRIES HOLDING CORPORATION LIMITED (VINACOMIN)	187
	NGUYEN Thi Hong Loan	
31	INVESTMENT IN OCCUPATIONAL SAFETY AND HEALTH BRINGS COMPETITIVE ADVANTAGES	190
	NGUYEN Thi Hoai Nga, Jürgen KRETSCHMANN	
32	OVERVIEW OF LEGAL POLICIES ON OCCUPATIONAL SAFETY AND HEALTH, AND WORKER PROTECTION IN VIETNAM MINERAL ACTIVITIES	196
	HA Tat Thang, NGUYEN Anh Tho, PHAM Trung Thong, PHAM Van Viet	
33	SUCCESSFUL IMPLEMENTATION OF THE GERMAN RISK MANAGEMENT SYSTEM IN OCCUPATIONAL SAFETY AND HEALTH (OSH) TO SOUTH EAST ASIA - CULTURAL CONDITIONS AND CHALLENGES NGUYEN Thi Hoai Nga, Jürgen KRETSCHMANN	202
	MINERAL PROCESSING	
34	DEVELOPMENT OF LITHIUM RESOURCES - LATEST PROCESSING TECHNOLOGIES	209
J4	TRAN Thi Khuyen, LUONG Van Tri, Myong Jun KIM, TRAN Tam, Jeon Woong AN, Dong Jun KANG	207
35	THE FACTORS INFLUENCING ON JAROSITE PRECIPITATION PROCESS FOR REMOVING ALKALINE ELEMENTS FROM MANGANESE - SULFATE SOLUTION	216
	DAO Duy Anh	
36	TWO-STAGE FLOTATION FLOWSHEETS FOR THE APATITE-CARBONATE ORE LAO CAI, VIET NAM	219
	NGUYEN Hoang Son, NHU Thi Kim Dung	
37	RESEARCH INTO COAL SLIME AFFECT ON SEPARATION EFFICIENCY OF FINE COAL IN THE FLUIDIZED BED SEPARATOR PHAM Van Luan, NGUYEN Ngoc Phu	222
38	GOLD RECOVERY FROM TAILINGS OF SIN QUYEN COPPER ORE PROCESSING PLANT – LAO CAI	226
	NGUYEN Thi Hong Gam	
39	RECOVERY OF COPPER FROM TA PHOI - LAO CAI ORE SAMPLES BY FLOATATION	230
	NHU Thi Kim Dung, NGUYEN Hoang Son, VU Thi Chinh, PHUNG Tien Thuat	
	MATERIAL COMPOSITION OF BAUXITE CONCENTRATE FROM GIA NGHIA	

RESEARCH ON COMPLETE PROCESSING TECHNOLOGY OF ANTIMONY ORE FOR MAU DUE MINE - HA GIANG PROVINCE TRAN Thi Hien  RECOVERY OF CLEAN COAL PARTICLES INTO OVERFLOW PRODUCT OF THE FLUIDIZED BED SEPARATOR PHAM Van Luan, NGUYEN Hoang Son, NGUYEN Ngoc Phu  TUNNELLING AND GEOTECHNICAL APPLICATIONS  NUMERICAL INVESTIGATION OF SURFACE SETTLEMENTS ABOVE A TUNNEL: INFLUENCE OF SEGMENTAL JOINTS AND DEFORMABILITY OF GROUND DO Ngoc Anh, Daniel DIAS, Pierpaolo ORESTE, Irini DJERAN-MAIGRE  STUDY TO ESTIMATE THE THICKNESS FOR THE ROCK LAYER PREVENTING THE DRIVING TUNNEL FACE ZONE WHICH IS ACTED BY THE HIGH PRESSURE UNDERGROUND WATER VO Trong Hung  EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF THE SPLIT HOPKINSON PRESSURE TESTS ON GRANITE ROCK DANG VAN Kien, HUANG Ge-Jia, VU Xuan Hong, Frederic PELLET  AN ASSESSMENT OF METHODS FOR IN-SITU STRESS MEASUREMENT IN DRILLING BOREHOLES DO Quang Khanh, Hyung-Sik YANG, NGUYEN Vict Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Vict Dinh SEGMENTAL LINING DESIGN IN SOFT SOIL - A COMPARISON BETWEEN	241 245 251
FLUIDIZED BED SEPARATOR PHAM Van Luan, NGUYEN Hoang Son, NGUYEN Ngoc Phu  TUNNELLING AND GEOTECHNICAL APPLICATIONS  NUMERICAL INVESTIGATION OF SURFACE SETTLEMENTS ABOVE A TUNNEL: INFLUENCE OF SEGMENTAL JOINTS AND DEFORMABILITY OF GROUND DO Ngoc Anh, Daniel DIAS, Pierpaolo ORESTE, Irini DJERAN-MAIGRE  STUDY TO ESTIMATE THE THICKNESS FOR THE ROCK LAYER PREVENTING THE DRIVING TUNNEL FACE ZONE WHICH IS ACTED BY THE HIGH PRESSURE UNDERGROUND WATER VO Trong Hung  EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF THE SPLIT HOPKINSON PRESSURE TESTS ON GRANITE ROCK DANG Van Kien, HUANG Ge-Jia, VU Xuan Hong, Frederic PELLET  AN ASSESSMENT OF METHODS FOR IN-SITU STRESS MEASUREMENT IN DRILLING BOREHOLES DO Quang Khanh, Hyung-Sik YANG, NGUYEN Vict Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Vict Dinh	251
NUMERICAL INVESTIGATION OF SURFACE SETTLEMENTS ABOVE A TUNNEL: INFLUENCE OF SEGMENTAL JOINTS AND DEFORMABILITY OF GROUND DO Ngoc Anh, Daniel DIAS, Pierpaolo ORESTE, Irini DJERAN-MAIGRE  STUDY TO ESTIMATE THE THICKNESS FOR THE ROCK LAYER PREVENTING THE DRIVING TUNNEL FACE ZONE WHICH IS ACTED BY THE HIGH PRESSURE UNDERGROUND WATER VO Trong Hung  EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF THE SPLIT HOPKINSON PRESSURE TESTS ON GRANITE ROCK DANG Van Kien, HUANG Ge-Jia, VU Xuan Hong, Frederic PELLET  AN ASSESSMENT OF METHODS FOR IN-SITU STRESS MEASUREMENT IN DRILLING BOREHOLES DO Quang Khanh, Hyung-Sik YANG, NGUYEN Viet Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	
INFLUENCE OF SEGMENTAL JOINTS AND DEFORMABILITY OF GROUND DO Ngoc Anh, Daniel DIAS, Pierpaolo ORESTE, Irini DJERAN-MAIGRE  STUDY TO ESTIMATE THE THICKNESS FOR THE ROCK LAYER PREVENTING THE DRIVING TUNNEL FACE ZONE WHICH IS ACTED BY THE HIGH PRESSURE UNDERGROUND WATER VO Trong Hung  EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF THE SPLIT HOPKINSON PRESSURE TESTS ON GRANITE ROCK DANG Van Kien, HUANG Ge-Jia, VU Xuan Hong, Frederic PELLET  AN ASSESSMENT OF METHODS FOR IN-SITU STRESS MEASUREMENT IN DRILLING BOREHOLES DO Quang Khanh, Hyung-Sik YANG, NGUYEN Viet Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	
THE DRIVING TUNNEL FACE ZONE WHICH IS ACTED BY THE HIGH PRESSURE UNDERGROUND WATER  VO Trong Hung  EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF THE SPLIT HOPKINSON PRESSURE TESTS ON GRANITE ROCK  DANG Van Kien, HUANG Ge-Jia, VU Xuan Hong, Frederic PELLET  AN ASSESSMENT OF METHODS FOR IN-SITU STRESS MEASUREMENT IN DRILLING BOREHOLES  DO Quang Khanh, Hyung-Sik YANG, NGUYEN Viet Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN  LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM  TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	259
PRESSURE TESTS ON GRANITE ROCK  DANG Van Kien, HUANG Ge-Jia, VU Xuan Hong, Frederic PELLET  AN ASSESSMENT OF METHODS FOR IN-SITU STRESS MEASUREMENT IN DRILLING BOREHOLES  DO Quang Khanh, Hyung-Sik YANG, NGUYEN Viet Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN  LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM  TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	
DRILLING BOREHOLES  DO Quang Khanh, Hyung-Sik YANG, NGUYEN Viet Ky  APPLIED RESEARCH ON USING RESIN REINFORCED BOLTS FOR SUPPORTING THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN  LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM  TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	263
THE HEADINGS ALONG THE COAL SEAMS AT UNDERGROUND VIETNAM COAL MINES IN VINACOMIN  LE Van Cong, PHAM Quang Nam, DO Quang Tuan  IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM  TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	272
IMPACT ASSESSMENT OF EXCAVATION SCHEMES ON ROCK MASS AROUND HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	279
48 HUOI QUANG UNDERGROUND POWER CAVERN IN VIET NAM TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	
	284
49 ANALYTICAL AND NUMERICAL ANALYSIS NGUYEN Chi Thanh, DO Ngoc Anh, PHAM Tien Vu, NGUYEN Tai Tien	291
ANALYSIS OF PLASTIC ZONE AROUND TUNNELS WHEN CONSIDERING THE INITIAL STRESS PARAMETERS BY USING EXAMINE 2D SOFTWARE TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Tai Tien, NGUYEN Viet Dinh	299
ROCK STABILITY ANALYSIS USING BLOCK THEORY: A CASE STUDY ON GEOLOGICAL HAZARD EVALUATION IN ROCK MASS  NGUYEN Quoc Phi, HWANG SangGi, PHI Truong Thanh, NGUYEN Phuong, NGUYEN Kim Long	305
RESEARCH ON STRESS STATE AND DEFORMATION AROUND BIG TUNNELS WITH  52 EXCAVATION STAGES IN BEDDING AND NON-HOMOGENEOUS ROCK  TRAN Tuan Minh, NGUYEN Duyen Phong, NGUYEN Viet Dinh	309
PARAMETER SELECTION FOR LANDSLIDE SUSCEPTIBILITY MAPPING NGUYEN Quoe Phi, HWANG SangGi, NGUYEN Kim Long, DO Van Nhuan,	509

	NGUYEN Van Binh	
54	RESEARCH ON SUITABLE SOLUTIONS FOR SLOPE STABILITY AT NA DUONG SURFACE COAL MINE	323
	LUU Van Thue, LE Xuan Thu, DO Kien Cuong, NGUYEN Huu Huan	
;	DRILLING – BLASTING ENGINEERING	
	NEW METHOD FOR THE CALCULATION OF LOW BENCH BLASTING	
55	PARAMETERS FOR PRACTICAL CONDITIONS OF VIETNAM	331
	PHAM Van Hoa, Carsten DREBENSTEDT, LE Van Quyen	
	ANALYZING THE FACTORS AFFECTING TO THE VIBRATION WHEN BLASTNG	
56	WITH NON-ELECTRIC DETONATORS	338
	NHU Van Bach, NGUYEN Dinh An, LE Qui Thao	
57	RESPONSE SPECTRA OF AIR - DECK BLASTING	341
	PIRAT Jaroonpattanapong SIMULATING THE INTERFERENCE PROCESS OF TWO EXPLOSION WAVES ON	
	THE PLANE CONNECTING TWO EXPLOSIVE CONTOUR DRILLHOLES SIDE BY	
58	SIDE	345
	DAM Trong Thang, BUI Xuan Nam	
	DETERMINATION OF REASONABLE POWDER FACTOR FOR VIETNAM	
59	LIMESTONE QUARRIES	350
2,	NGUYEN Dinh An, NHU Van Bach, NGUYEN Van Sang, TRAN Khac Hung, TRAN	
	Dinh Bao RESEARCH RESULTS ON ESTABLISHING A FORMULA FOR CALCULATING	
60	GENERAL CHARGE OF THE EXPLOSION CRATER IN ROCK AND SOIL	353
00	LE Van Trung, DAM Trong Thang, NGUYEN Trong Canh	
	BLASTING NEARBY 35KV MEDIUM-TENSION LINE AT BAU XEO INDUSTRIAL	
61	ZONE, VIETNAM	357
01	TRAN Khac Hung, TRAN Van Dung, TRINH Quang Trung, NGUYEN Luong Minh, DO Van Chien, NGUYEN Van Long, DO Van Nang	33/
	ANALYZING THE AFFECTING FACTORS, PROPOSING AND APPLYING	
62	SUITABLE SOLUTIONS FOR IMPROVING THE QUALITY OF TUNNEL WALLS BY DRILLING - BLASTING METHOD	360
	DAM Trong Thang	
E.	NVIRONMENTAL PROBLEMS AND PROCESSING TECHNOLOGI	ES
	MINE REHABILITATION MONITORING USING SATELLITE-BORNE IMAGERY	_ <del>_</del>
63	RAVAL S., MERTON R. N., LAURENCE D.	367
	LEACHING OF HEAVY METALS FROM MINE TAILINGS OF A CLOSED COPPER	
64	MINE	378
	Toshifumi IGARASHI, Asuka SASAKI	
	LEACHING OF ARSENIC, BORON, SELENIUM AND HEAVY METALS FROM TUNNEL EXCAVATED ROCKS AND THEIR MITIGATION	
65	Carlito Baltazar TABELIN, Takahiko ARIMA, Toshifumi IGARASHI, Tetsuro YONEDA	382
66	EFFECTS OF INFLUENT WATER ON PASSIVE TREATMENT SYSTEMS FOR ACID	391
	D. DO DO DE MEDODET MATERIAL OF THOUSE INDIVIDUAL OF THOUSE	

	MINE DRAINAGE VU Dinh Hieu, MAI The Toan, LE Ngoc Ninh, LE Thi Thu Hoa	
67	FEATURES OF ARSENIC DISTRIBUTED IN GROUNDWATER IN NAM DINH DO Van Binh, DO Thi Hai, TRAN Kim Ha	399
68	EFFECTS OF RESUSPENSION EVENT ON WATER QUALITY OF A CONTAMINATED LAKE  NGUYEN Thuy Lan	404
69	RESULTS OF MONITORING OF RADIOACTIVITIES IN THE ATMOSPHERE AT THE WEST LAKE REGION, HANOI, VIETNAM HOANG Huu Duc, DAU Xuan Hoai, DINH Tien Hung, VU Thi Kim Duyen, LE Hong Khiem, PHAM Duc Khue, PHAN Viet Cuong	411
70	BIOLOGICAL SULFATE REDUCTION USING GAS - HYDROGEN AND METHANOL AS ENERGY AND CARBON SOURCE FOR TREATING ACID MINE DRAINAGE NGUYEN Hoang Nam, Peter KUSCHK, Juliana RICHTER, DAU Xuan Hoai, NGUYEN Van Thanh	415
71	MODEL EXPERIMENTS ON THE TREATMENT OF ACID MINE DRAINAGE EFFLUENTS IN CONSTRUCTED WETLANDS - SYSTEM COMPARISONS NGUYEN Hoang Nam, Peter KUSCHK, Juliana RICHTER, LE Duc Liem	422
72	CHARACTERIZATION OF A VIETNAMESE COAL FLY ASH AND ITS POSSIBLE UTILIZATIONS BUI Hoang Bac, BUI Xuan Nam, VU Dinh Hieu, NGUYEN Tien Dung	434
73	HIGH RESOLUTION SOIL MOISTURE MAPPING USING AMSR-E OBSERVATIONS AND A SATELLITE-BASED RAINFALL PRODUCT TRAN Xuan Truong	439
74	MONITORING OF INTERTIDAL SEDIMENT DISTRIBUTION IN THE BA LAT ESTUARY BY USING SATELLITE IMAGERY NGUYEN Thi Ngoe, Katsuaki KOIKE	451
	LIST OF AUTHORS	459