CONTENTS

Preface xi
Sponsors xiii
List of Participants xv

Session A1: Opening

Introduction to the Porous Media Theory
R. de Boer 3

2-D Localization Analysis of Saturated Porous Media
B. A. Schrefler and H. W. Zhang 13

Session A2: Constitutive Modelling

Evolution of the Volume Fractions in Compressible Porous Media
S. Diebels 21

Constitutive Relations for Thermo-Elastic Porous Solid within the Framework of Finite Deformations
J. Bluhm 27

A Generalized Cam-Clay Model
S. Krenk 33

Session A3: Experiments and Parameter Identification

Theoretical and Experimental Investigation into Mechanical Properties of High Density Foam Plastics
Z. Lu, Z. Gao and R. Wang 41

A Unified Sensitivity Analysis Approach for Parameter Identification of Material Models in Fluid-Saturated Porous Media
R. Mahnken and P. Steinmann 51

Session A4: Numerical Aspects

Numerical Solution of Soil Freezing Problem by a New Finite Element Scheme
J. Hartikainen and M. J. Mikkola 61
Space-Time Finite Elements and Adaptive Strategy for the Coupled Poroelasticity Problem
K. Runesson, F. Larsson and P. Hansbo

Poster Session A

Packed-to-Fluidized Bed Transition and Origin of Particle-Free Regions
A. K. Didwania

h-Adaptive Strategies Applied to Multi-Phase Models
W. Ehlers, P. Ellsiepen and M. Ammann

A Viscoelastic Two-Phase Model for Cartilage Tissues
W. Ehlers and B. Markert

A Poroelastic Material with a Scale Independent Pressure-Volume Relation
D. Elata

Numerical Modelling of Cartilage as a Deformable Porous Medium
A. J. H. Frijns, E. F. Kaasschieter and J. M. Huyghe

Numerical Description of Elastic-Plastic Behavior of Saturated Porous Media
J. Skolnik

Session B1: Homogenization

Effective Physical Properties of Sandstones
J. Widjajakusuma and R. Hilfer

Perspective of Computational Micro-Macro-Transition for the Postcritical Analysis of Localized Failure
C. Miehe and M. Lambrecht

Micromechanics of Unsaturated Porous Media
X. Chateau and L. Dormieux

Influence of Porosity on the Response of Fibrous Composites
S. C. Baxter, C. T. Herakovich and A. M. Roerden

Session B2: Biot’s Theory

Non Linear Thermomechanical Couplings in Unsaturated Clay Barriers
P. Dangla, O. Coussy, E. Olchitzky and C. Imbert
Porothermoelasticity in Transversely Isotropic Porous Materials
Y. Abousleiman and S. Ekbote

Constitutive Description of Fluid-Porous Solid Immiscible Mixtures. Derivation of the Effective Stress-Strain Relation
J. Kubik and M. Cieszko

Session B3: Flow in Porous Media

Two-Phase Flow Modelling of Flood Defense Structures
M. Paul, R. Hinkelmann, H. Sheta and R. Helmig

A Sand Erosion Problem in Axial Flow Conditions on the Example of Contact Erosion due to Horizontal Groundwater Flow
A. Scheuermann, I. Vardoulakis, P. Papanastasiou and M. Stavropoulou

Session B4: Waves in Porous Media I

Rayleigh Waves in Porous Media Saturated with Liquid
A. A. Gubaidullin and O. Y. Kuchugurina

Geometry Effects on Sound in Porous Media
A. Cortis, D. M. J. Smeulders, D. Lafarge, M. Firdaouss and J. L. Guermond

Mechanics of Liquefaction in Saturated Granular Soils
A. Sawicki

Poster Session B

Fluid Mechanics in Minkowski Space. Modelling of Fluid Motion in Porous Materials with Anisotropic Pore Space Structure
M. Cieszko

Modelling of Soils by Use of the Theory of Porous Media
W. Ehlers and P. Blome

Integration and Calibration of a Plasticity Model for Granular Materials
L. Jacobsson and K. Runesson

Mechanical Properties of Modified Wood
S. J. Kowalski and L. Kyziol

Water Transport in Phase-Changing Snowpacks
S. Sellers
Session C1: Localization

Modelling of Localisation at Finite Inelastic Strains in Fluid Saturated Porous Media
L. Sanavia, B. A. Schrefler, E. Stein and P. Steinmann

Influence of Density and Pressure on Spontaneous Shear Band Formations in Granular Materials
E. Bauer and W. Huang

Localization Analysis of a Saturated Elastic Plastic Porous Medium Based on Regularized Discontinuity
R. Larsson and J. Larsson

Session C2: Extended Models

Shear Band Localization in Frictional Geomaterials: Basic Modelling and Adaptive Computations
W. Ehlers and P. Ellsiepen

Analysis of Instability Conditions for Normally Consolidated Soils
R. Nova and S. Imposimato

Structure and Elastic Properties of Reinforced Cellular Plastics
J. Brauns

Session D1: Micromechanics

Effective Stress and Capillary Pressure in Unsaturated Porous Media
A. K. Didwania

Porous Medium Mechanics and the Skin Barrier
J. M. Huyghe, P. M. van Kemenade, L. F. A. Douven and P. H. M. Bovendeerd

Discrete Element Modelling of Compaction of Cylindrical Powder Particles
P. Redanz and N. A. Fleck

Session D2: Fracture and Damage

Modeling of In-Situ Solution Mining Processes
H.-B. Mühlhaus, J. Liu and B. E. Hobbs
Coupling of Damage and Fluid-Solid Interactions in Quasi-Brittle Unsaturated Porous Materials
*J. Carmeliet* 307

An Influence of Initial Porosity on Damage Process in Semi-Brittle Polycrystalline Ceramics under Compression
*T. Sadowski and S. Samborski* 313

**Session D3: Swelling, Drying and Shrinkage**

The Physical Role of Crack Rate Dependence in the Long-Term Behaviour of Cementitious Materials
*G. P. A. G. van Zijl, J. G. Rots and R. de Borst* 321

Macroscopic Swelling of Clays Derived from Homogenization
*C. Moyne and M. Murad* 329

Extending Griffiths Theory to Cohesive Types of Dried Materials
*S. J. Kowalski and K. Rajewska* 335

**Session D4: Waves in Porous Media II**

Reflection and Transmission of Waves at a Fluid/Porous-Medium Boundary
*A. I. M. Denneman, G. G. Drijkoningen, D. M. J. Smeulders and C. P. A. Wapenaar* 343

Poroelasto-Electric Longitudinal Waves in Porous Wet Long Bones - a Transmission Line Model
*R. Uklejewski* 351

Scattering of SH-Waves by a Porous Slab - Approximate Solution
*Y. C. Angel and A. R. Aguiar* 357

**Session D5: Applications**

A Three-Dimensional Nonlinear Model for Soil Consolidation
*R. Lancellotta, G. Musso and L. Preziosi* 365

**Poster Session D**

Drying Induced Stresses in Viscoelastic Sphere
*J. Banaszak and S. J. Kowalski* 381
Settlements of Sand due to Cyclic Twisting of a Tube
R. Cudmani and G. Gudehus 387

Studies of Rayleigh Scattering of Longitudinal Waves in Saturated Porous Materials
J. Kubik, M. Kaczmarek and J. Kochanski 397

A Thermomechanical Model for Partially Saturated Expansive Clay
A. J. Lempinen 403

Constitutive Modeling of Charged Porous Media
M. M. Molenaar, J. M. Huyghe and F. P. T. Baaijens 409

Damage of Porous Materials during Drying
G. Musielak 415

Author Index 421